FLUKE®

Instruction Manual

Model

1912A

Multi-Counter

FLUKE®

Instruction Manual

NOTE

This manual documents the Model 1912A Multi—Counter and its assemblies at the revision levels shown in appendix 7a, Table 7a—1. If your instrument contains assemblies with different revision letters it will be necessary to either update or backdate this manual. Refer to the supplemental change/errata sheet for newer assemblies, or to the backdating sheet for older assemblies.

Model

1912A

Multi-Counter

P/N 467746

9/77

LIMITED WARRANTY

The JOHN FLUKE MFG. CO., INC., warrants each instrument it manufactures to be free from defects in material and workmanship under normal use and service for the period of one year from date of purchase. This warranty extends only to the original purchaser. This warranty shall not apply to fuses, disposable batteries (rechargeable type batteries are warranted for 90 days), or any product or parts which have been subject to misuse, neglect, accident or abnormal conditions of operations.

In the event of failure of a product covered by this warranty, John Fluke Mfg. Co., Inc., will repair and calibrate an instrument returned to an authorized Service Facility within one year of the original purchase; provided the warrantor's examination discloses to its satisfaction that the product was defective. The warrantor may, at its option, replace the product in lieu of repair. With regard to any instrument returned within one year of the original purchase, said repairs or replacement will be made without charge. If the fault has been caused by misuse, neglect, accident or abnormal conditions of operations, repairs will be billed at a nominal cost. In such case, an estimate will be submitted before work is started, if requested.

ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS SHALL BE LIMITED TO A PERIOD OF TWELVE MONTHS FROM THE DATE OF PURCHASE. THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS OR ADEQUACY FOR ANY PARTICULAR PURPOSE OR USE. JOHN FLUKE MFG. CO., INC. SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT OR OTHERWISE.

NOTE: Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

If any fault develops, the following steps should be taken:

1. Notify the John Fluke Mfg. Co., Inc. or nearest Service facility, giving full details of the difficulty, and include the Model number, type number, and serial number. On receipt of this information, service data or shipping instructions will be forwarded to you.

2. On receipt of the shipping instructions, forward the instrument, transportation prepaid. Repairs will be made at the Service Facility and the instrument returned, transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of John Fluke Mfg. Co., Inc., instruments should be made via United Parcel Service or "Best Way*" prepaid. The instrument should be shipped in the original packing carton; or if it is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact the nearest Fluke Technical Center.) Final claim and negotiations with the carrier must be completed by the customer.

The John Fluke Mfg. Co., Inc. will be happy to answer all application or use questions, which will enhance your use of this instrument. Please address your requests or correspondence to: JOHN FLUKE MFG. CO., INC., P.O. Box 43210, MOUNTLAKE TERRACE, WASHINGTON 98043, Atten: Sales Dept. For European Customers: FLUKE (Nederland) B.V., Zevenheuvelenweg 53, Tilburg, The Netherlands.

* For European customers, Air Freight prepaid.

John Fluke Mfg. Co., Inc. • P.O. Box 43210 • Mountlake Terrace, Washington 98043

Rev. 12/77

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1912A Multi-Counter

Section 1
Introduction & Specifications

NOTE

The 1912A Multi-Counter may be ordered with a variety of options and accessories. To determine if any options have been installed on your instrument, and if the installation will affect the specifications of the instrument, see the spec decal on the bottom of the instrument's case.

1-1. INTRODUCTION

1-2. The model 1912A is a digital multi-counter capable of making measurements in 3 modes of operation on two input channels, over a wide range of input frequencies (5Hz to 520MHz). The 3 modes of operation are; frequency (may be obtained on both channels A & B, valid for the entire input range) period (input on channel A only, valid for input frequencies of up to 2 MHz) and totalize (also obtainable on channel A only, will accumulate input frequencies to 9999999 before overflowing and resetting).

1-3. In addition to the 3 modes of operation the 1912A incorporates the following front panel push button features; Channel A attenuator (for high level inputs), self-check (for verifying overall circuit operation), autorange (automatically selects optimum resolution), 4 resolution switches (manually selects optimum resolution), reset (enables operator to manually clear the display and initiate a new count), and the power switch (standard units have an on/off position, and battery units have a standby mode replacing the off position). In conjunction with these controls there is the trigger level potentiometer (located on front panel, adjust channel A trigger level) and the clock switch (selects internal/external timebase) located on rear panel.

NOTE

Unless an external timebase is to be used the clock switch must be left in the internal position.

1-4. The overall operation of the 1912A is simplified by allowing the following features to be fully regulated by the control circuitry. These features are: decimal positioning (the position of the decimal is a function of the selected range, autoreset (initiates a new count when any front panel switch other than the attenuator is activated), hysteresis circuit (prevents unnecessary up down ranging in the auto mode), range annunciators (displays the appropriate units, kHz, MHz, usec, msec, for which ever resolution has been selected) and overflow annunciator (indicates that the display has exceeded it's capacity).

1-5. The model 1912A includes fused protection for the input power on the main pcb and for the channel B input on the prescaler pcb. The 1912A may be ordered in one of three input power versions, these are; 100, 115 or 230 volt all compatible with line frequencies from 48 to 440 Hz. When the —01 battery option is installed the unit may be operated and/or charged from the following line voltages and frequencies; 100V 48-52, and 58-62 Hz, 115V 58-62 Hz, or 230V 48-52 Hz.

1-6. Several options and accessories are available for use with the 1912A. The options are listed and described in Table 1-1. No options are field installable, therefore all options must be specified at time of order, also due to space limitations options —01 and —02 are mutually exclusive. The accessories are listed and described in Table 1-2. These accessories are compatible with all options and can be ordered at time of purchase or after purchase. Detailed information concerning each option and accessory is given in Section -6 of this manual.

Table 1-1. 1912A Options

OPTION NO.	DESCRIPTION
—01	Battery Power Supply
—02	Data Output Unit
—03	TCXO, 10 MHz, 2 PPM
—04	TCXO, 10 MHz, 0.5 PPM

Table 1-2. 1912A Accessories

ACCESSORY MODEL NO.	DESCRIPTION
MOO-100-714	Dust Cover
MOO-200-611	Offset Rack Adapter
MOO-200-612	Center Rack Adapter
MOO-200-613	Dual Rack Adapter (For two 1912A's or one 1912A with either an 8000A or 8600A).
C-80	Vinyl Case Cover with Accessory Pouch
C-86	Carying Case (For a single 1912A)
C-85	Dual Carrying Case (For two 1912A's or a 8000A or 8600A)
A-53	Telescope Whip Antenna

1-7. SPECIFICATIONS

1-8. Specifications for the 1912A multi-counter are presented in Table 1-3. Table 1-3 lists first (under operating ranges and timebase) the 1912As inherent characteristics and secondly Table 1-3 identifies the instruments electrical and general characteristics under the heading of the same name.

Table 1-3. 1912A Specifications

OPERATING RANGES

FREQUENCY CHANNEL A	5 Hz - 125 MHz
FREQUENCY CHANNEL B	50 MHz - 520 MHz
PERIOD CHANNEL A	5 Hz - 2 MHz
TOTALIZE CHANNEL A	1 COUNT TO 9999999

TIMEBASE

	Standard	—03 Option	—04 Option
FREQUENCY	10 MHz	(2 ppm TCXO) 10 MHz	(0.5 ppm TCXO) 10 MHz
AGING RATE	$\pm 5 \times 10^{-7}$/mo	$\pm 3 \times 10^{-7}$/mo	$\pm 3 \times 10^{-7}$/mo
TEMPERATURE STABILITY	0 to 50°C $\pm 5 \times 10^{-6}$	$\pm 2 \times 10^{-6}$	$\pm 5 \times 10^{-7}$
	20 to 30°C $\pm 2 \times 10^{-6}$(typ)	$+5 \times 10^{-7}$(typ)	$\pm 5 \times 10^{-7}$(typ)
LINE VOLTAGE FOR ±10% CHANGE	$\pm 1 \times 10^{-7}$	$\pm 1 \times 10^{-7}$	$\pm 5 \times 10^{-8}$

CHARACTERISTICS (ELECTRICAL)

CHANNEL A

INPUT IMPEDANCE	1M ohm shunted by less than 30 pf, AC coupled.
SENSITIVITY	15 mV rms: 5 Hz to 100 MHz 25 mV rms: 100 MHz to 125 MHz
ATTENUATOR	Decreases sensitivity by approximately 10.

Table 1-3. 1912A Specifications (Continued)

TRIGGER LEVEL	±0.5V range
OVERLOAD LEVEL	DC + AC: Less than 360V peak AC: 250V rms 5 Hz to 1 kHz. 10V rms above 1 kHz. (30V peak when operating from batteries.)
CHANNEL B IMPUT IMPEDANCE	50 ohms nominal. VSWR less than 2.5:1
SENSITIVITY	Less than 15 mV rms: 50 MHz to 175 MHz Less than 30 mV rms: 175 MHz to 250 MHz Less than 25 mV rms: 50 MHz to 520 MHz
OVERLOAD	DC + AC: Less than 100V Peak (30 V Peak when operating from batteries). AC: 5V rms, fuse protected.
EXTERNAL TIMEBASE INPUT	
FREQUENCY REQUIRED	10 MHz
SENSITIVITY	300 mV rms
INPUT IMPEDANCE	Greater than 1k ohm
MAXIMUM INPUT	5V pk-pk
RESOLUTION	
FREQUENCY	Four manually selected resolutions of 100 Hz, 10 Hz, 1 Hz and .1 Hz. Autorange will automatically seek to fill all seven digits but will not select a resolution better than 1 Hz.
PERIOD	Manual selection provides single period measurement, or the averaging of 10^1, 10^2, or 10^3 periods. 10^0 single period (100 ns resolution) 10^1 periods averaged (10 ns resolution) 10^2 periods averaged (1 ns resolution) 10^3 periods averaged (100 ps resolution) Autorange will automatically seek to fill all seven digits and, if the input frequency is high enough, may select 10^4 periods averaged (10 ps resolution), but will not select a gate time greater than 1 sec.
TOTALIZE	Accumulates up to 9999999 counts then resets to zero and activates overflow indicator.
GENERAL	
DISPLAY	7 digit LED, Leading zero suppression.
ANNUNCIATION	MHz, kHz, msec, usec, overflow
	Time between successive measurements is 200 ms nominal plus measurement time.
AUTORANGE	In both frequency and period modes autoranging includes a unique 20% hyseresis in its switching threshholds to eliminate redundant up range/down range commands. This allows measurements to be made on signals containing large amounts of FM or PM. Hysteresis can be reset by depressing reset button.

Table 1-3. 1912A Specifications (Concluded)

AUTORESET	A new measurement sequence is started every time a front panel push button is activated except the attenuator.	
OPERATING TEMPERATURE	1912A:	0°C to 50°C
	1912A-01:	0°C to 40°C if operating from line.
STORAGE TEMPERATURE	1912A	-40°C to +70°C
	1912A-01	-40°C to +60°C
POWER REQUIREMENTS	1912A:	100/115/230±10%, 48 - 440 Hz, 8W max.
	1912A-01:	100V ± 10%, 48 - 52 Hz
		100V ± 10%, 58 - 62 Hz
		115V ± 10%, 58 - 62 Hz
		230V ± 10%, 48 - 52 Hz, 8.5W max.

NOTE! Voltage and frequency must be specified at time of order.

DIMENSIONS	Width: 8.55 inches 217.2 mm	
	Height: 2.52 inches 64 mm	
	Depth: 10.65 inches 270.5 mm	
WEIGHT	1912A:	3.2 lbs max 1.5 kgm max.
	1912A-01:	4.8 lbs max. 2.2 kgm max.

OPTION —01 (BATTERY)*

TYPE	Rechargeable Nicad
CHARGE TIME	16 hrs with power switch off at less than 30°C.
OPERATING TIME	4 hrs minimum (Battery capacity reduced if charged at greater than 30°C.)

OPTION —02 (DATA OUTPUT)*

DATA OUTPUTS	7 digits with overflow decimal and units information in BCD parallel/ digit serial format at CMOS levels.
OTHER OUTPUTS	7 digit strobe signals. Update signal, leading zero suppression signal.

TCXO

TIMEBASES	(See timebase characteristics for detailed specifications)
OPTION —03	2 ppm TCXO
OPTION —04	0.5 ppm TCXO

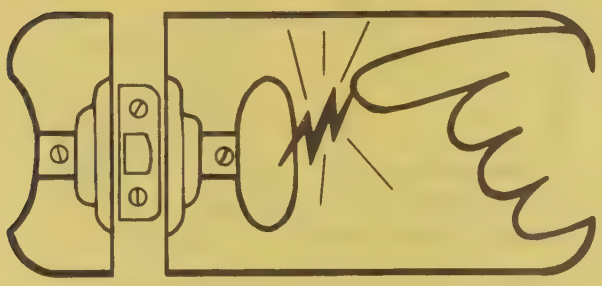
NOTE! All options must be installed at time of ordering. No options are field installable.

**Due to space limitations within the instrument the 1912A may be ordered with either Option, —01 or —02, but not both.*

static awareness

A Message From

John Fluke Mfg. Co., Inc.

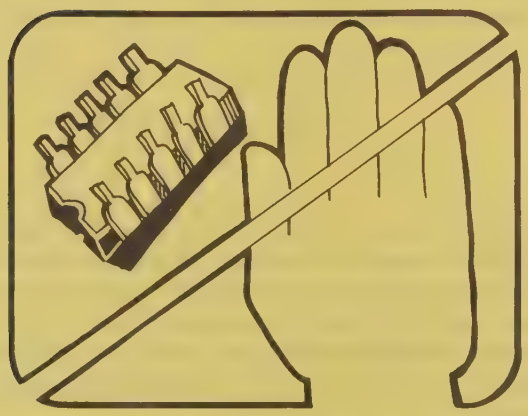


Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

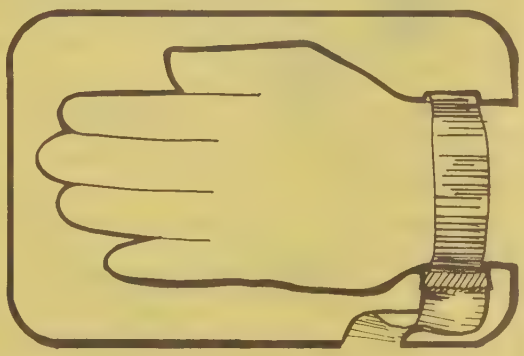
1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol "⊗".

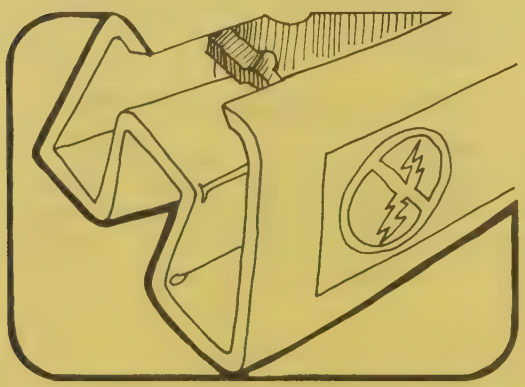
The following practices should be followed to minimize damage to S.S. devices.



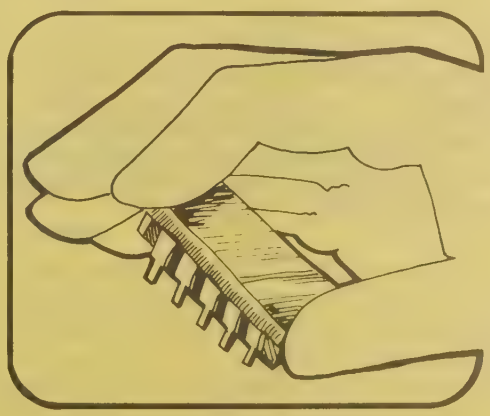
1. MINIMIZE HANDLING



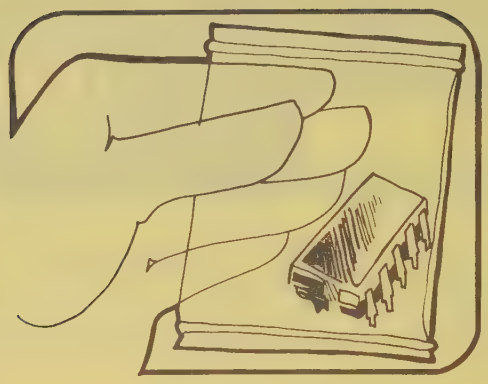
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES



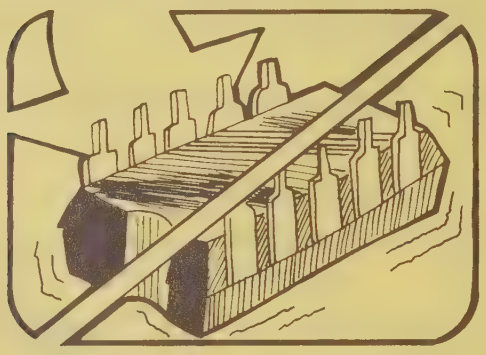
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



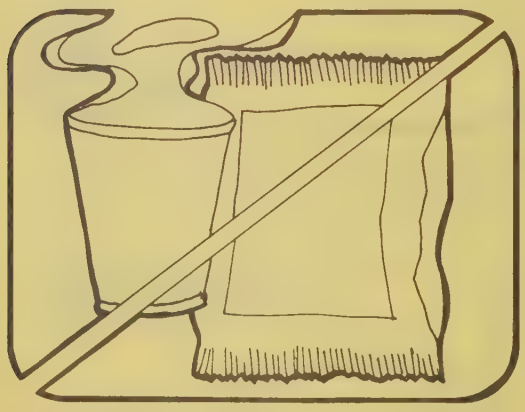
4. HANDLE S.S. DEVICES BY THE BODY



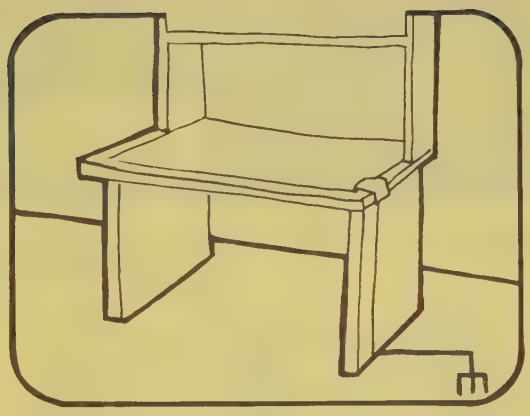
5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT



6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE



7. AVOID PLASTIC, VINYL AND STYRAFOAM IN WORK AREA



8. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION

9. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.

10. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

Anti-static bags, for storing S.S. devices or pcbs with these devices on them, can be ordered from the John Fluke Mfg. Co., Inc.. See section 5 in any Fluke technical manual for ordering instructions. Use the following part numbers when ordering these special bags.

John Fluke Part No.	Bag Size
453522	6" x 8"
453530	8" x 12"
453548	16" x 24"
454025	12" x 15"

Section 2
Operating Instructions

2-1. INTRODUCTION

2-2. This section of the manual contains information regarding the installation and operation of the Model 1912A. Should any difficulty be encountered during the operation please contact your nearest John Fluke sales representative or the John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace, Washington 98043, telephone: (206) 774-2211. A list of sales representatives is located in Section 7 of this manual.

2-3. SHIPPING INFORMATION

2-4. The Model 1912A is packaged and shipped in a protective container. Upon receipt of the instrument, a thorough inspection should be made to reveal any possible shipping damage. Section 4 contains an initial procedure check (table 4-2) that lists the correct display reading for all possible modes of operation. This check should be completed as part of the inspection.

2-5. If reshipment of the equipment is necessary the original container should be used. If the original container is not available, a new container may be obtained from the John Fluke Mfg. Co. Please reference the instrument model number (1912A) when requesting a new shipping container.

2-6. INPUT POWER (LINE)

2-7. The Model 1912A has three available input power configurations; 100V, 115V and 230V, all compatible with line frequencies of 48 Hz to 440 Hz. The main pcb parts list in Section 5 list the component changes for each input power configuration.

NOTE

A decal located on the instrument's bottom specifies the input power the unit has been configured to operate from.

2-8. INPUT POWER —01 OPTION (BATTERY)

2-9. The Model 1912A-01 may be operated and recharged from the same input voltages as the line model. However, when the —01 Option is installed, the 1912A's operating characteristics, such as maximum input level, change accordingly. For further information see Section 1 and Section 6, —01 Option.

2-10. RACK INSTALLATION

2-11. The 1912A is designed for either bench top use or for installation in a standard 19-inch equipment rack, using an optional accessory rack mounting kit. Rack mounting kits are available for left, right, center, or side-by-side mounting of the 1912A. Installation information of the rack mounting accessories is given in Section 6 under Rack Installation.

2-12. OPERATING FEATURES

2-13. The location of all 1912A controls, indicators and connectors are shown in Figure 2-1. and described in Table 2-1.

2-14. OPERATING NOTES

2-15. The following paragraphs describe various conditions which should be considered before operating the 1912A. These conditions, such as maintenance, fuse, and overload protections, will familiarize the operator with the capabilities and limitations of the 1912A.

2-16. Fuses

2-17. The Model 1912A has two standard fuses. One, the input line fuse located on the rear panel, see Figure 2-1, is a 1/8 watt slow blow for 100V, 115V input voltages, and 1/16 watt slow blow for 230V inputs. The other standard fuse is a 0.2 amp pigtail & plug-in type which is in series with the channel B input connector. This fuse and a spare is located on the prescaler pcb (see Section 4, Access).

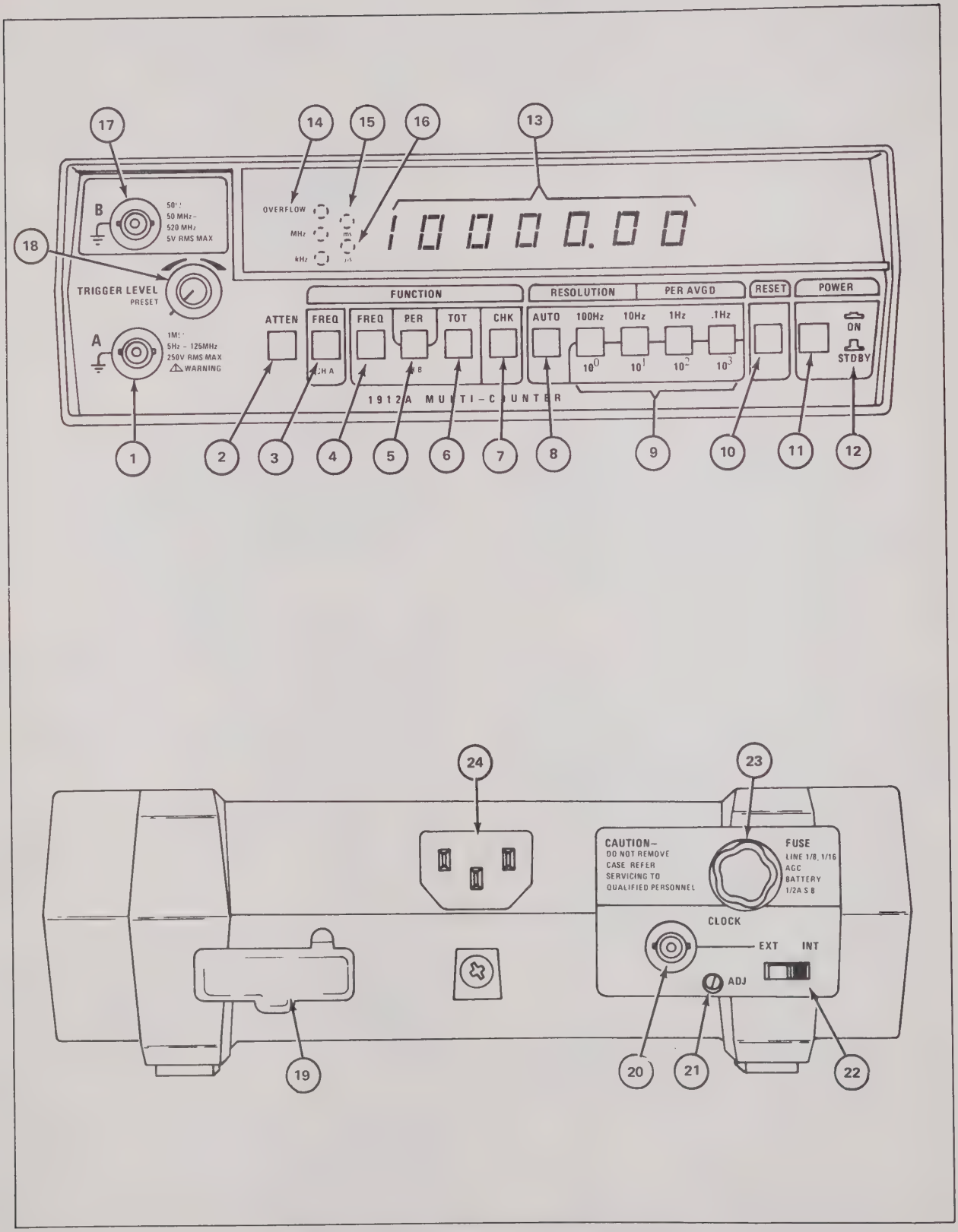


Figure 2-1. 1912A Control and Indicator Locations

Table 2-1. 1912A Control and Indicator Functions

Fig. 2-1. REF. NO.	NAME	FUNCTION
1	BNC Input Connector Front Panel Chan. A	Accepts input freq. of 5 Hz to 125 MHz
2	Attenuator Switch	Selects 10:1 attenuation for high level inputs on channel A.
3	Function Switch Channel B	Selects frequency function 50 MHz to 520 MHz.
4	Function Switch	Selects frequency function, 5 Hz to 125 MHz.
5	Function Switch	Selects period function, 5 Hz to 2 MHz.
6	Function Switch	Selects totalize function, 1 count to 9999999.
7	Function Switch	Selects self-check.
8	Resolution Switch	Selects auto-range in freq. and period modes.
9	Resolution Switches	Manually selects gate time; or period resolution.
10	Reset Switch	Manually resets front panel & sequencer, U6.
11	Power Switch	Two position: in (unit on) out (unit off).
12	STDBY —01 Option	When power switch is in this position with the —01 option installed the unit is off but the batteries are still being charged (if unit is connected to the line)
13	Data Display	Seven LED digits with leading zero suppression..
14	Annunciator	Overflow-lights to show count exceeds display capacity.
15	Annunciator	Illuminates to identify display units, MHz/ms
16	Annunciator	Illuminates to identify display units, kHz/us.
17	BNC Input Connector Channel B	Accepts input frequencies of 50 MHz to 520 MHz @ 5V rms max.
18	Triggering Level	Selects manual or preset triggering level of channel A.
19	DOU Output Connector —02 Option	Provides output connector for DOU data (in BCD serial format).
20	Clock Input Connector	Provides input connection for 10 MHz clock signal.
21	Standard Timebase Y1 adjustment	Provides calibration adjustment of Y1 without removing unit from case.
22	Mode Switch	Selects reference frequency, internal or external.
23	Fuse Holder	1/8, 1/16 Amp fuse, slow blow line versions, ½ amp fuse slow blow battery version.
24	3 Prong Connector	Provides connection for line voltage.

2-18. Fuse —01 Option

2-19. When the —01 Option is installed the line fuse is changed, and a fuse located on the main pcb is added to protect the battery charging circuit. For further information see Section 6, —01 Option and Section 4, Fuse Replacement.

2-20. Input Connection

2-21. Signals to be measured by the Model 1912A may be applied to either the Channel-A BNC connector or the Channel-B BNC connector. If Channel-A is to be used, the input frequency must be between 5 Hz and 125 MHz. If Channel-B is to be used, the input frequency must be between 50 MHz and 520 MHz Connection to either channel must be made via a coaxial cable with a mating BNC connector.

2-22. Operation

2-23. Use the following procedure for initial turn-on of the 1912A:

1. Connect the instrument to the appropriate line power (see bottom decal on instrument).
2. Depress the power switch to the ON position
3. Select autorange and self-check mode, display should read 100.0000 kHz. If not, refer to Section 4, Troubleshooting.

2-24. Overload Protection

WARNING!

THE OUTSIDE CONTACT OF THE BNC CONNECTOR IS TIED DIRECTLY TO EARTH GROUND THROUGH THE POWER PLUG. DO NOT CONNECT THE ACTIVE LEAD OF THE INPUT SIGNAL TO THE OUTSIDE CONTACT OF THE COUNTER, IRREPAIRABLE DAMAGE TO THE COUNTER OR EQUIPMENT UNDER TEST MAY RESULT. TO MEASURE POWER LINE FREQUENCIES IT IS RECOMMENDED TO USE A STEPDOWN TRANSFORMER TO THE COUNTER'S INPUT.

2-25. On Channel A the model 1912A will accept inputs as high as 250Vac between 5 Hz and 1 kHz. At frequencies above 1 kHz the ac overload protection decreases to 10Vac rms. The 1912A will withstand peak voltages dc and ac up to 360V peak. On Channel B the model 1912A will accept peak input voltages as high as 100V peak dc and ac, or 5V rms ac.

2-26. Option Information

2-27. Supplementary information is necessary when operating a 1912A that is equipped with one or more options. Detailed information regarding the operating of each available option is given in Section 6.

2-28. Frequency Measurement

2-29. Perform frequency measurements as follows:

1. Perform the instructions listed under OPERATION of this section.
2. Depress the frequency measurement switch (Channel A) to select the frequency mode of operation.
3. Select the desired resolution, or select the autorange mode. If the input signal is completely unknown the autorange mode will select the optimum range to fill all 7 digits.

NOTE

In the frequency mode, automatic selection of the optimum range is made between the three shortest gate times. The 0.1 Hz resolution may be manually selected only.

4. Connect the input signal to the front panel bnc connector Channel A. If the display is unstable, due to perhaps noise, the reading may improve by using the attenuator switch, and/or trigger level adjustment.
5. Read the frequency value from the display and observe the unit of measurement indication (kHz or MHz) to the left of the display.

2-30. Period Measurement

2-31. Perform period measurement as follows:

1. Perform the instructions listed under OPERATION of this section.
2. Depress the PER switch to select the period mode of operation.
3. Select the desired number of periods to be averaged, or select the autorange mode. If the input signal is completely unknown the autorange mode will select the optimum range to fill all seven display digits.

NOTE!

In the period mode the autorange circuitry may select an additional gate time (10^4) which is not available as a manual selection.

4. Connect the input signal to the front panel channel-A bnc input connector.
5. Read the period measurement directly from the display, observe the annunciators (us & ms) and the decimal place.

2-32. Totalize Measurement

2-33. Perform the totalize measurement as follows:

1. Perform the instructions list under OPERATION of this section.
2. Depress the TOT switch to select the totalize mode of operation.
3. Connect the input signal to the front panel BNC connector channel-A.
4. Observe that the display shows the total number of events that have occurred.

NOTE!

No annunciators are used in the totalize mode other than the overflow, also no decimal point is required.

2-34. Self-Check Mode

2-35. The self-check mode provides a means of verifying proper overall operation of the model 1912A, excluding channel A & B inputs sections and the time base accuracy. To self check the unit proceed as follows:

1. Perform the instructions listed under OPERATION of this section.
2. Press the CHK switch to select the self-check mode.
3. Perform the self-checks listed in Table 3-1.

2-36. Input Conditioners (Channel A)

2-37. The model 1912A employs two input conditioners for channel-A located on the front panel. One is the attenuator, which is a two position switch (ON/OFF) that when activated, decreases the input level by approximately a factor of 10. The attenuator obtains this factor by reducing the gain and increasing the hysteresis to the custom chip U1. The other conditioner is an adjustable trigger level used to bias the broadband amplifier contained within U6. The trigger level may be left at the preset value, or may be adjusted manually to compensate for noisy inputs, or for pulse measurements.

Section 3
Theory of Operation

3-1. INTRODUCTION

3-2. This section of the manual contains an overall functional description followed by a block diagram analysis of the Model 1912A Multi-counter. Both discussions are supported by schematics and simplified block diagrams. The schematics of the individual pcb's may be found in Section 8 of this manual.

3-3. OVERALL FUNCTIONAL DESCRIPTION

3-4. Eight basic sections compose the circuitry of the model 1912A. They are: input, power supply, time base, main gate, high speed dividers, accumulator (U7), controller (U6), and the display. Figure 3-1 shows the relationship of these functions.

3-5. Frequency Mode (3.8 MHz Test Case)

3-6. To simplify the explanation of the overall circuit functions, assume that a 3.8 MHz signal has been applied to channel-A of the 1912A and that the 100Hz resolution and frequency mode switches have been selected. The waveforms shown in Figure 3-1 give an exploded view of the information contained on a particular line for that instant of time. For a complete list of these waveforms see Section 6, Figure 602-1. It should be noted that Figure 3-1 is only an overall block diagram and will not be configured exactly the same for the different modes of operation (see specific circuit function). However, since the frequence mode has been selected for this test case, Figure 3-1 will be referenced to in the following discussion.

3-7. For the frequency mode of operation the signal to be measured is applied to U1 which basically transforms it to standard ECL levels for application to the main gate. The ECL level will be passed to the high speed counters for a time determined by the selected range. The high speed decade counters then divide the unknown input to obtain the first and second digit information. This information is applied to the counters within U7 to obtain the rest of the digit information. The high speed counters are necessary because the maximum toggle speed of the counters within U7 is 2 MHz. The digit information is strobed into the latches by a memory update signal (MUP) generated by the controller U6. U6 also applies a pulse simultaneously with the digit strobe to position the decimal and to light the appropriate annunciators. The latches (within U7) will hold and present the entire digit information to the display on a common data bus. U7 also generates the strobe cycle to enable the correct LED to light. Each LED is strobed individually for a period of 90 usec's. This individual strobe scheme increases the LED life and decreases the energy consumption, persistence of the eye eliminates any flicker.

3-8. In review of this test case it can be seen that to obtain a count in the frequency mode the 1912A has utilized all seven of it's basic sections. Each of these sections will be discussed in detail under the block diagram analysis. However because one section, the controller, is basic to every other section and is essential to the operation of the 1912A in each mode of operation, it will be discussed now.

3-9. Controller (U6)

3-10. The controller is capable of performing numerous logic steps, see Figure 3-2, the first of which is start (step-1). Step-1 will be initiated whenever power is first applied to the counter, or if a new range, mode, or the reset switch has be actuated. Step-1 will initialize the counter to accept a new measurement. Step-2 is skipped as only odd numbered steps are used to order events. The next events in the controllers logic (step-3) enables the decade counters, contained within the accumulator, to count the frequency of the unknown signal in the frequency mode or the 10 MHz reference clock in the period mode.

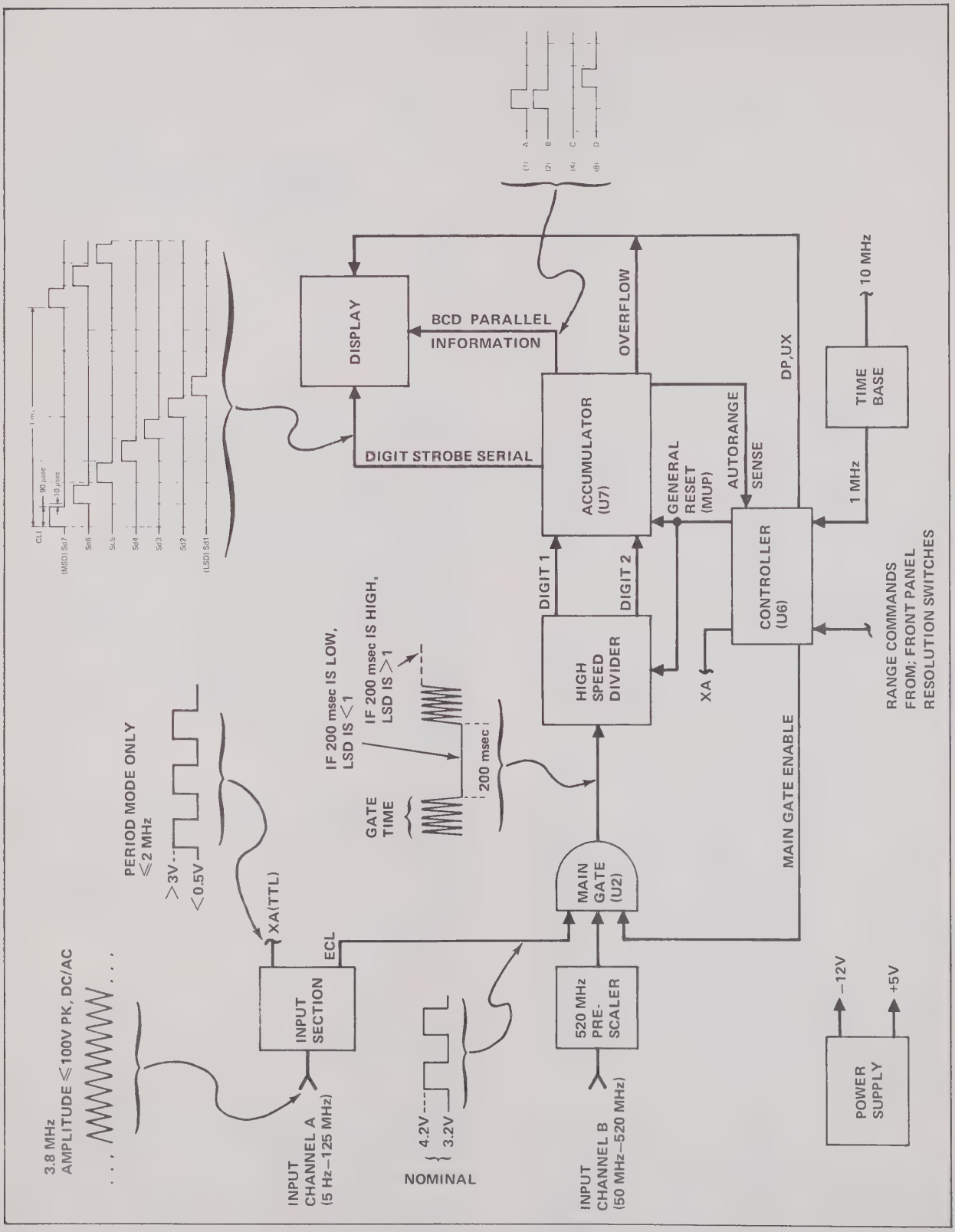


Figure 3-1. Frequency Mode (3.8 MHz Test Case)

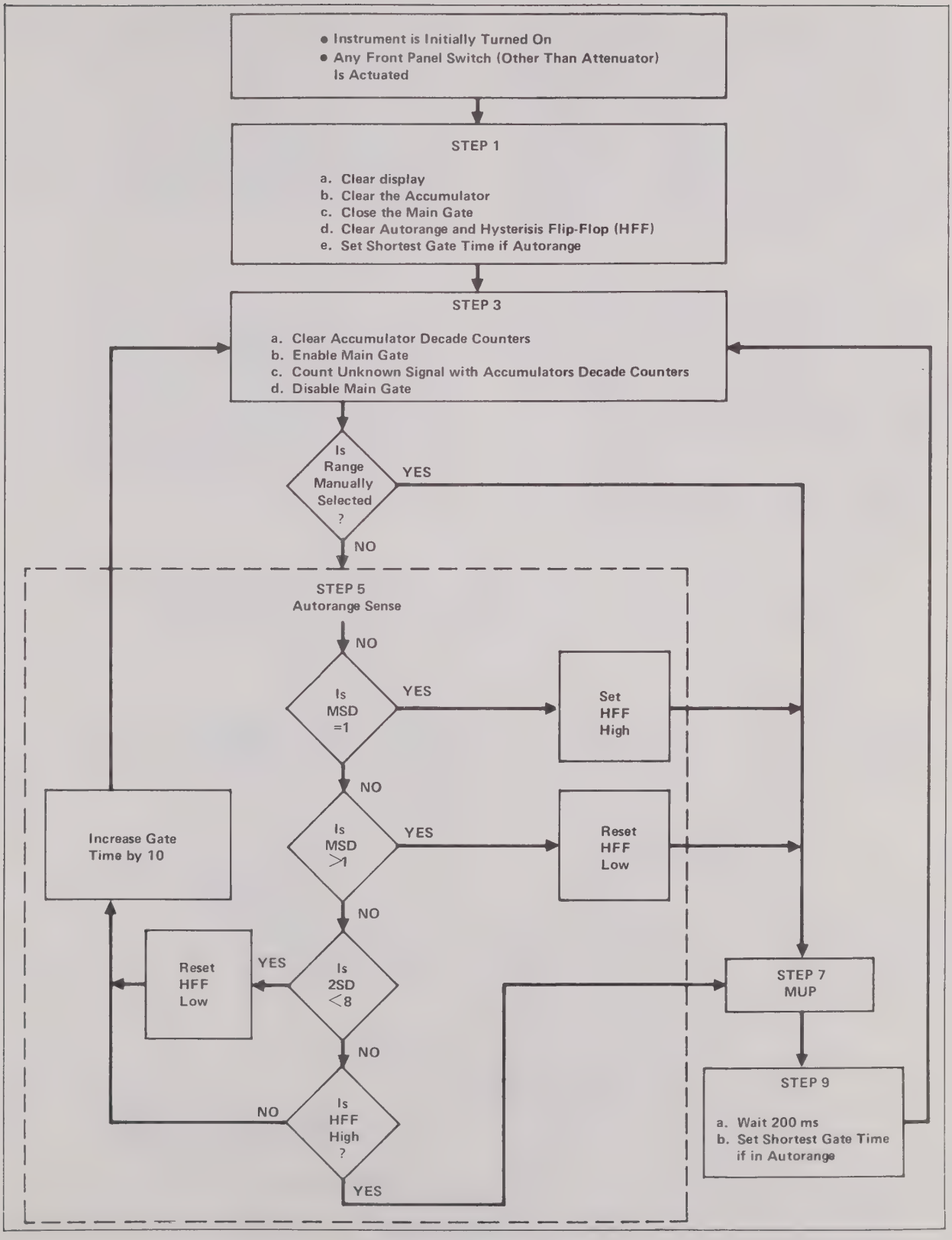


Figure 3-2. Controller Logic

3-11. Step-5 enables the autorange circuit. In this step the controller decides whether or not the range is adequate for optimum resolution. If the most significant digit (MSD) is less than one, then the optimum range has not been achieved and the controller will increase the gate time by a factor of 10. The controller will cycle through this until the MSD is one or greater, or until the longest gate time possible has been reached. If a range has been manually selected, then the resolution of the display (gate time) will be determined by the selected range, not the value of the MSD.

3-12. When in the autoranging mode the controller provides a hysteresis circuit which prevents a shift in range when the frequency of the input signal changes by up to 20%. To activate the hysteresis circuit, the MSD must first be equal to one which sets the hysteresis flip-flop (HFF) high. The hysteresis then introduced by the controller will tend to hold the present range until the second significant digit (2SD) falls below 8.

3-13. Step 7 is called memory update (MUP). This step enables the controller to shift the count obtained in step 3 to the display. The next step, step 9, is a wait period of 200msecs which limits the controller to a maximum of five readings per second.

3-14. The controller's logic will continue to cycle from step 3 through step 9 once every 200msecs plus the selected gate time and will only go to step 1 if the instrument is first turned off and then back on again, or if a new mode, range or the reset switch is actuated.

3-15. Period Mode

3-16 The period of an unknown signal is measured by counting a reference frequency during a specified number of input periods (See Figure 3-3.). The model 1912A obtains it's period measurement by applying the unknown input to the range control, using that count to derive the gate time and then counting the 10 MHz signal supplied by the time base. Selection of the range control will directly determine the resolution of the period measurement. The longer the gate time, the more periods averaged and consequently better resolution.

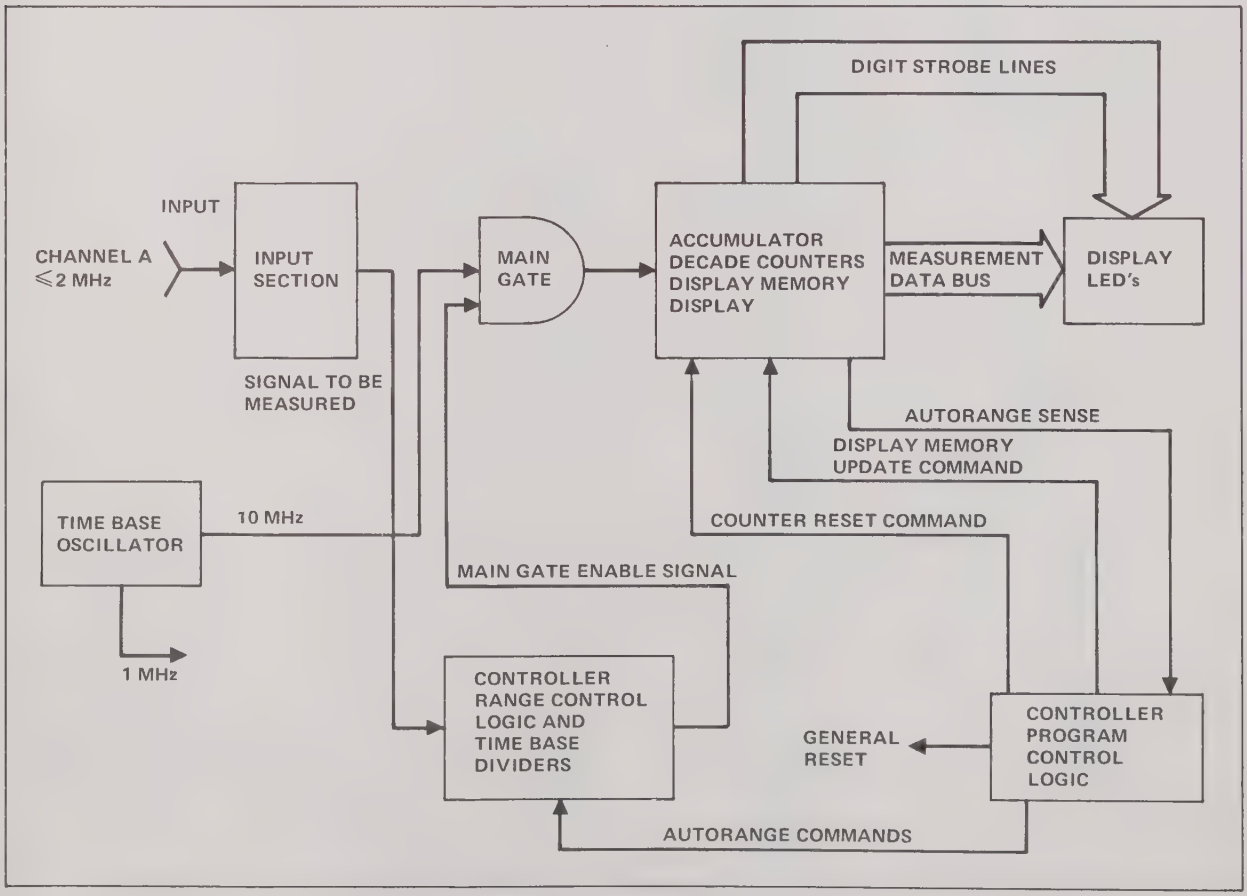


Figure 3-3. Period Mode

3-17. Totalize Mode

3-18. The totalize mode is used to count the total number of events as they happen (See Figure 3-4.). This is achieved by completely bypassing the range and controller functions and continuously enabling the main gate. The totalize mode will count up to 9999999 at which time the overflow indicator will light and the display will reset itself to zero. The overflow indicator is the only annunciator used in the totalize mode. A new count may be manually initiated by depressing the reset button, or by selecting a new range.

3-19. Self Check Mode

3-20. The self-check mode is an internal verification system that uses the 10 MHz signal from the time base as a reference (See Figure 3-5.). When in the self-check mode manual selection of each range and the reset switch will verify that all sections of the counter, other than the input and time base itself, are working properly (see Table 3-1. for correct display readings).

Table 3-1. Display Readout in Self Check Mode

MODE	DISPLAY	ANNUNCIATOR
Auto	10000.00	kHz
100 Hz	10.0000	kHz
10 Hz	10000.00	kHz
1 Hz	0000.000	Overflow kHz
0.1 Hz	000.0000	Overflow kHz
Reset	888.8888	kHz

3-21. Block Diagram Description

3-22. The following block diagram description will detail each individual function that the 1912A is capable of performing in a logical input to output order. Each individual function is keyed to a corresponding block diagram and/or supported in part by the schematics located in Section 8.

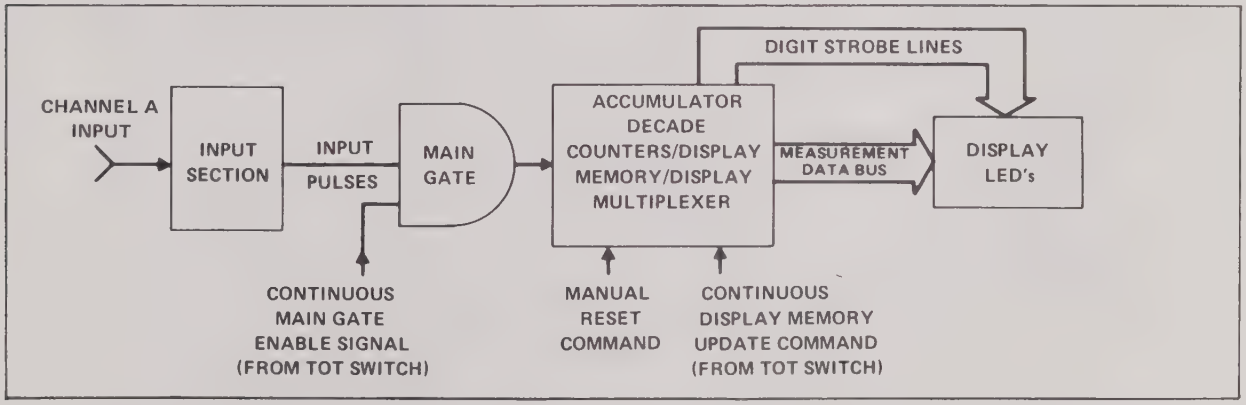


Figure 3-4. Totalize Mode

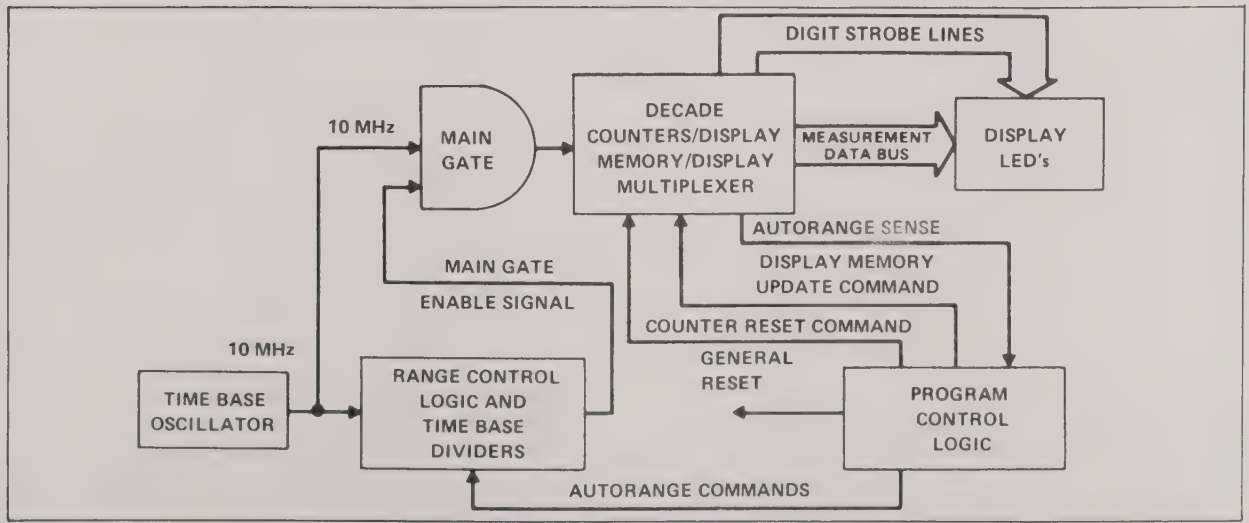


Figure 3-5. Self Check Mode

3-23. Input Section Channel-A

3-24. An Input signal from the BNC connector is coupled through C1 to the buffer amplifier, Q1 (see Figure 3-6). It is then applied to the custom IC U1, which includes in part a broadband amplifier, schmitt trigger, and output amplifier. The first section of U1, the broadband amplifier provides gain over the wide range of input frequencies. The second section of U1 is a schmitt trigger used to square the output to obtain fast, clean transitions and the third section, the output amplifier, translates the input signal to the standard ECL and TTL levels for application to the main gate (U2) and the controller (U6) respectively.

3-25. Input Section Channel-B

3-26. For channel B inputs (see Figure 3-7) the signal is amplified and fed to a dual high speed flip-flop where it is effectively divided by four to bring it within the range of the high speed decade counters. The prescaler also contains a level detector which blocks the prescalers operation when the input levels drop below a preset value (drop out). The manual selection of the B channel simultaneously inputs a prescaler code to the controller, U6. This code will cause the controller to quadruple the gate time to compensate for the reduction of the input frequency by the prescaler.

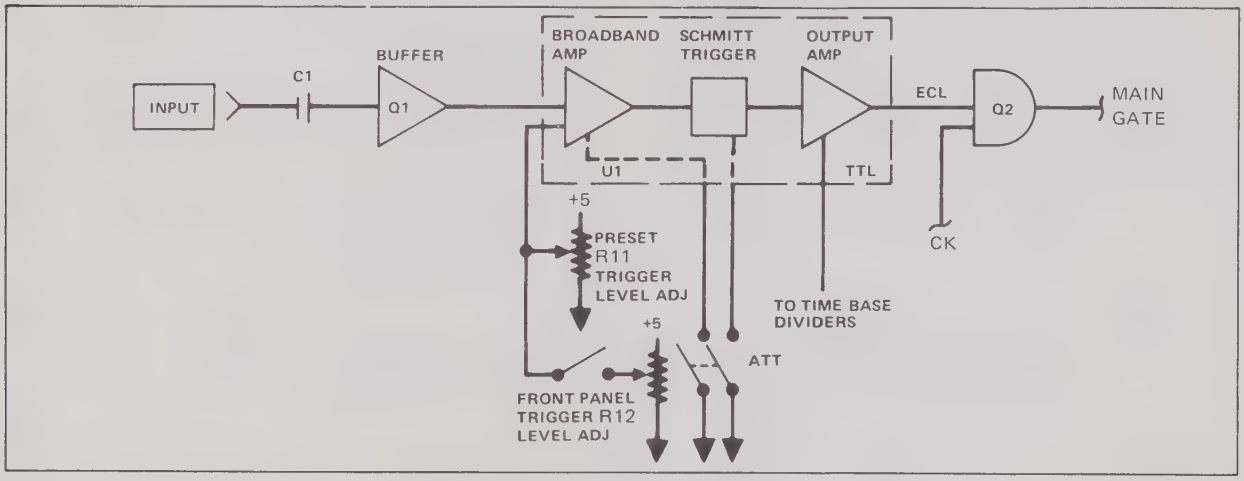


Figure 3-6. Input Section Channel A

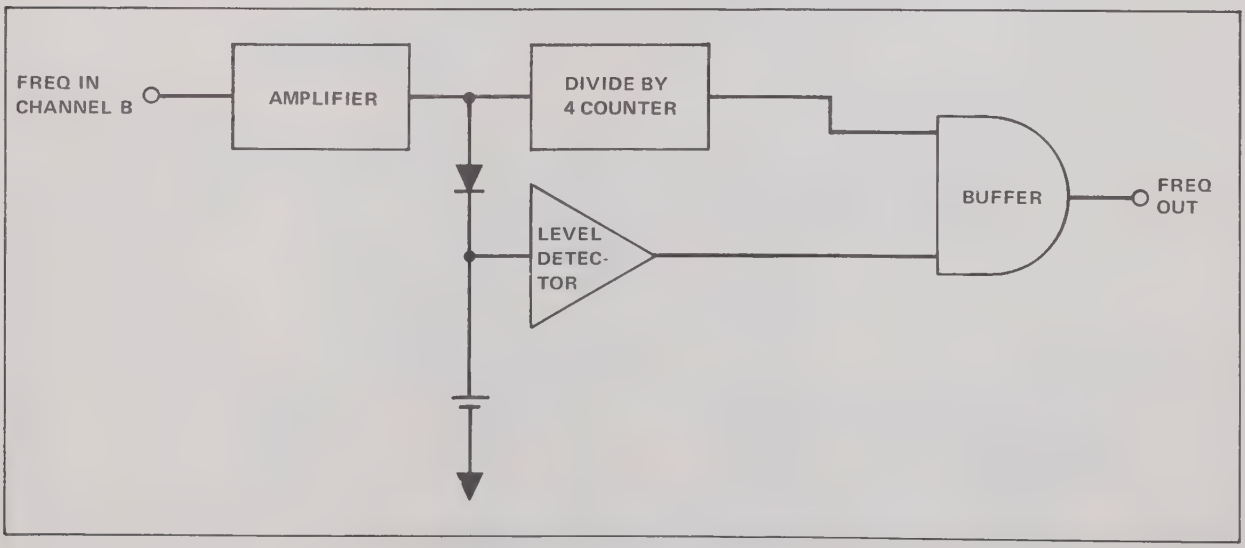


Figure 3-7. Input Section Channel B

3-27. Main Gate High Speed Counters

3-28. The high speed counters, U2, U3B, U4A, U4B, (first digit) and U8 (second digit) are used to supply the digit information for the LSD and 6sd respectively. These counters are separate from the rest of the counters contained within the accumulator U7 because of the toggle speed they must handle.

3-29. At step 3c in the controllers logic (see Figure 3-2) a gate pulse is generated and applied to the J & K inputs of the main gate, U2. The unknown input, refer to schematic 8-2, is then applied to the clock input of U2 and toggles it on the negative going edge. U2's output and the outputs from U3, U4A, and U4B combine to make up the bcd information for the first digit. The bcd information for the second digit is derived solely from U8.

3-30. At step 3d in the controllers logic the gate pulse (GATE) goes high and with a logic 1 applied to the J & K input of the U2 the clocking input is ignored and the counting of the unknown input is stopped. The digit information will now be held by the latches contained within U7 until step 7 (MUP) of the controllers logic.

3-31. Time Base

3-32. The time base consists of a 10MHz crystal (Y1) a buffer amplifier (Q2), a nor gate (U5) and a decade counter (U9). The time base is configured as a Colpitts oscillator, see schematic 8-2, whose frequency is controlled by the crystal Y1. The amplifier Q7 and Nor gate U5 combine to provide a buffered output and the decade counter divides the 10MHz crystal frequency to obtain the 1MHz time base. In the frequency mode the 1MHz signal is applied to U6 to obtain the range control logic. In the period and self-check modes the 10MHz signal is applied to the main gate and counted as the unknown while the actual unknown signal is used to derive the gate time.

3-33. Decimal Point Logic

3-34. The model 1912A uses a scheme to position the decimal which is syncronous with the appropriate digit strobe. An encoded input generated by the selection of a resolution switch (see Table 3-2) will enable one of the six possible AND gates contained within U6. A decimal positioning strobe (DP) will then be generated by U6 simultaneously with one of the 6 digit strobes, which will light the corresponding decimal. If autoranging has been selected the encoded range input to the AND gates will change as the value of the signal being measured changes. This effectively shifts the decimal position as the input changes to ensure maximum display capacity. The annunciators, kHz/msec, MHz/usec, are lit by the same scheme as the decimal, however the enabling strobe generated by U6 is now UX (see Figure 8-2, sheet 3 of 3).

Table 3-2. Range Encoding (Frequency)

INPUT TO RANGE SWITCH ENCODING a) FREQUENCY A MODE					
Input to U6 Pin			Gate Time	Decimal Location Output	Annunciated Units Output
22	23	24			
0	1	0	10 msec*	D4	MHz
1	1	0	0.1 sec*	D2	KHz
0	0	1	1.0 sec*	D3	KHz
1	0	1	10 sec	D4	KHz
1	1	1	Autorange	■	■

**Obtainable gate times in autorange mode.*
■Not a fixed value.

3-35. Range Control Logic (Frequency Mode)

3-36. Selection of a range may be determined manually by one of the front panel range switches or automatically by selecting the autorange mode. If the range is manually selected, a predetermined range command will be applied to U6 (see Table 3-2) which determines the division ratio of the 1MHz clock pulse. The 1MHz clock pulse enables the main gate for a length of time directly proportional to the division ratio. The same scheme is used when the autorange mode is selected, however, in this case the range command is not a set value. The encoded range command in the autorange mode will change, causing the division of the 1MHz signal to change which will enable the gate time to increase or decrease depending upon the value of the signal being measured.

3-37. Range Control Logic (Period Mode)

3-38. The range control logic for the period mode is similar to that used in the frequency mode except that the 1MHz clock input is replaced with the channel A, TTL level input (XA). The XA signal is divided by the decade counters within U6 and like the 1MHz signal it's division ratio is determined by the encoded range command (see Table 3-3). The divided XA signal is then however, applied to the main gate and used as the enable signal to allow the 10MHz time base output to be counted and stored by the latches contained within U7, and then displayed as the period measurement.

3-39. Autorange Logic

3-40. When used, the autorange logic will ensure maximum display limits by automatically increasing the gate time until all seven digits are filled or until the longest gate time has been reached. The operation of the autoranging logic is similar to the manual resolution selection, however the range encoding lines, input to U6 on

pins 22, 23, and 24, are placed by the interation counter internal to U6. The interation counter will then select one of the 3 shortest gate times in the frequency mode (see Table 3-2) or if the period mode has been selected the autorange logic may pick from any of the manually selectable gate times with the addition of 10^4 periods averaged which is not manually selectable (see Table 3-3).

Table 3-3. Range Encoding (Period)

INPUT TO RANGE SWITCH ENCODING (PERIOD MODE)						
Input to U6 Pin			Gate Time	Period	Decimal Location Output	Annunciated Units Output
22	23	24				
0	0	0	1.0 msec	10^0	D5	msec
1	0	0	10 msec	10^1	D6	msec
0	1	0	0.1 sec	10^2	D4	μsec
1	1	0	1.0 sec	10^3	D5	μsec
0*	0*	1*	10 Sec*	10^4	D6	μsec
1	1	1	Autorange	**	**	**

* *Obtainable only in the period mode of operation when using the autorange resolution.*

***Not applicable.*

3-41. Display Memory and Multiplexer

3-42. The display memory and multiplexer consist of counters, latches and gates, all internal to U7 (see Figure 3-8) used to accumulate, hold and present the digit information to the display. When Step 7 is reached (see Figure 3-2) the controller generates a memory update signal (MUP). At that time the contents of the decade counters are shifted into a series of four bit latches. A 10kHz oscillator and a 10 stage ring counter internal to U7 generate strobe signals to apply the contents of the four bit latches onto the common display data bus in parallel. Information on the data bus is decoded by a seven segment decoder for application to the display.

3-43. Display

3-44. The display (see Figure 3-9) consists of seven, seven-segment LED's, each containing it's own decimal point. The appropriate LED is enabled simultaneously with the enabling of a gate in the display multiplexer (U7). This allows the digit information to be applied via the common data bus to all LED's in parallel. However, only the LED that is enabled by the ten stage ring counter within U7 will accept the data and consequently light.

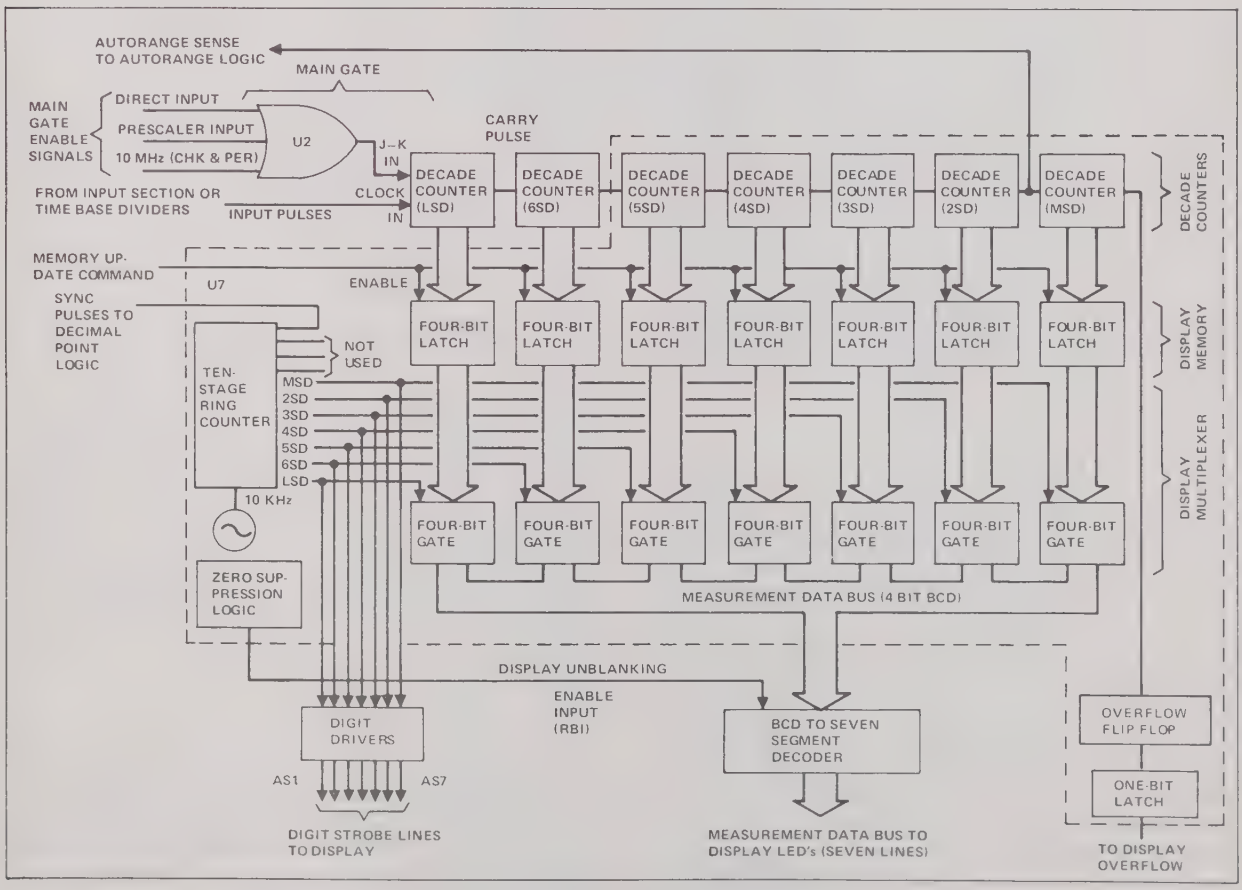


Figure 3-8. Display Memory and Multiplexer

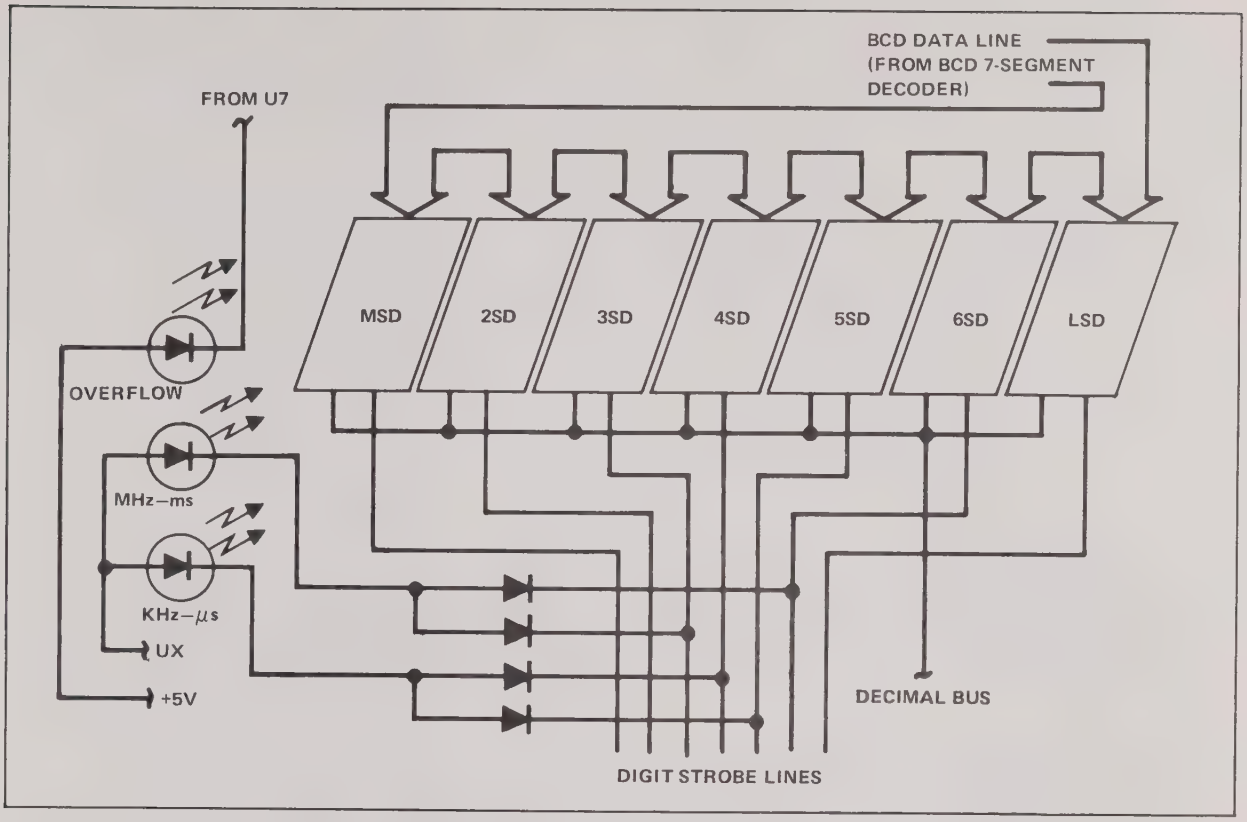


Figure 3-9. Display

Section 4
Maintenance

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

4-1. INTRODUCTION

4-2. This section has been designed to enable the maintenance personnel to isolate and correct any instrument malfunction in the shortest possible time. This includes service information, general maintenance, performance test, calibration and troubleshooting (Flow Charts). The performance test is recommended as an acceptance test when the unit is first received, it may however be used any time that the operator suspects a descrepency in the overall operation of the instrument.

4-3. Calibration is a separate procedure that requires the unit to be removed from its case. It is recommended that the instrument be calibrated once a year or whenever the instrument fails to meet a performance test.

4-4. Troubleshooting charts located at the end of this section list many possible instrument malfunctions and a corrective procedure for each. The test equipment required for the performance test, calibration and troubleshooting is listed in Table 4-1. If the recommended equipment is not available, instruments having equivalent specifications may be used.

4-5. SERVICE INFORMATION

4-6. Each instrument that is manufactured by the John Fluke Mfg. Co., Inc. is warranted for a period of one year upon delivery to the original purchaser. The warranty is given on the back of the title page located in the front of this manual.

4-7. Factory authorized calibration and service for each Fluke product is available at various world-wide locations. A complete list of these service centers is included in section 7 of this manual. If requested, an estimate will be provided to the customer before work is begun on instruments that are beyond the warranty period. However, any malfunctions that do occur within the limits of the warranty will be corrected at no charge.

4-8. GENERAL MAINTENANCE

4-9. Access and Removal Information

WARNING!

FOR SOME MAINTENANCE PROCEDURES IT WILL BE NECESSARY TO APPLY POWER TO THE INSTRUMENT WITH THE SHIELDS REMOVED. FOR THIS CONDITION THE OPERATOR SHOULD BE AWARE THAT THE FOLLOWING POINTS WILL BE AT THE POWER LINE POTENTIAL.

1. Rear panel AC connector
2. Transformer winding (primary)
3. Land pattern on main pcb (component side) between transformer and front panel power switch, S1
4. Jumper W7 located on bottom of main pcb

Table 4-1. Required Test Equipment

EQUIPMENT NOMENCLATURE	MINIMUM SPECIFICATIONS	RECOMMENDED EQUIPMENT
Quartz oscillator frequency standard with 10 MHz output.	1 x 10^{-8} ppm stability	HP 105A/B
Low frequency oscillator	5 Hz to 10 MHz 5 mV to 500 mV	Fluke 6010, or Wave Tek 3001
High frequency oscillator	10 MHz to 520 MHz 5 mV to 500 mV	Wave Tek 2001
RF millivoltmeter with 50 Ω terminator, + high impedance terminator	5 mV sensitivity 10 kHz to 520 MHz	Boonton 92B
Multimeter	With at least a 200 mV range in DC & AC functions	Fluke 8000A
Oscilloscope	Greater than 100 mV/div (vertical sensitivity) using FET probes	Tek 465

4-10. Use the following procedure to gain access to the interior of the instrument.

1. With the power switch in the OFF position (out) disconnect the line cord, external clock input and DOU connection (if used).
2. Remove the phillips screw on the rear panel directly below the line connector.
3. Hold rear of instrument case firmly and pull front panel straight out.
4. Top and bottom shields may now be removed by removing six #2-56 screws.
5. All replaceable parts are now visible.
6. Reassemble in the opposite order.

NOTE

To avoid contaminating the pcb with oil from your fingers, handle it by the edges or wear gloves. If the pcb does become contaminated, refer to the cleaning procedure given later in this section.

4-11. CLEANING

CAUTION!

If any solvent is used, such as freon, it should be kept clear of switches, potentiometers, plastics and transformer windings since it removes lubrication and breaks down winding insulation.

4-12. Periodically clean the multi-counter to remove accumulated dust, grease and other contaminents using the following procedure:

NOTE

To avoid hairline scratches on the front panel lens it is recommended to use a very soft cloth such as facial tissues when cleaning the front panel.

1. Clean the front panel and exterior surfaces with ethyl alcohol or soft cloth dampened with a mild solution of detergent and water.
2. If cleaning of the interior is necessary, use clean, dry air at low pressure (20psi). If contaminants remain, individual pcbs can be cleaned using anyhydrous ethyl alcohol, however any items likely to be affected by the alcohol (batteries, etc.) should first be removed. Excess alcohol should be blown free with the pressurized air followed by a thorough drying. Do not use drying temperatures in excess of 50°C.

4-13. FUSE REPLACEMENT

4-14. The line fuse (F1) is located on the rear panel. If replacement is necessary, use a 1/8 amp slow blow for 100V and 115V line powered units and a 1/16 amp slow blow for 230V line power and a ½ amp slow blow for battery powered units. The 1912A also has individual fuses for protection of the channel-B prescaler and the

main pcb battery charging circuit (for battery units only). Each of these fuses are located directly on their respective pcbs (for access and replacement of the main pcb fuse, see section-6).

4-15. PERFORMANCE TEST

4-16. The following performance tests are designed to compare the actual operation of the instrument with the specifications given in section-1. These are sensitivity tests and are suitable for incoming inspection, and periodic checks to verify overall operation. If the instrument fails to meet any of these tests the authorized personnel should proceed to the calibrating procedure.

4-17. Initial Procedure Check

4-18. The following conditions must be met before proceeding to the sensitivity test.

1. All external inputs should be made via a shielded cable with a compatible bnc connector and must not exceed the input limits as specified in section-1.
2. Internal/external clock switch must be in the internal position.
3. Trigger level must be in the preset position.
4. Attenuator switch should be in the out position.
5. Unit to met the following checks, see Table 4-2.

4-19. Sensitivity Check (Channel A)

1. Connect the low frequency generator, set to 10Hz at 15 mV to the channel-A input. If using the 6010A or 6011A signal generators terminate their outputs into 50Ω.

NOTE

The wavetek generator (3001) is an analog frequency selectable instrument whose output is directly proportional to the accuracy of the adjustments made by the operator.

2. Energize the counter and select the frequency function, channel-A and auto resolution.
3. Confirm that the display reads 0.010 kHz ± 1 digit.
4. Disconnect the low frequency generator and connect the high frequency source terminated into 50 Ω at a T-connector to the channel-A input, also connect an RF millivoltmeter to the T-connector.
5. Refer to Table 4-3, and set the generator for 150mV at about 10MHz to obtain a reference reading. Now lower the generator amplitude level until the counters display becomes unstable. Verify that the level at which the display changes is below 15mV.
6. Repeat Step-5 for each frequency listed in Table 4-3. Note that at 125MHz the level must be below 25mV before the display becomes unstable.

Table 4-2. Initial Procedure Check

FUNCTION	RESOLUTION	±1 COUNT DISPLAY	ANNUNCIATORS
FREQ CH A/CH B	100 Hz	0.0000	MHz
FREQ CH A/CH B	10 Hz	0.00	kHz
FREQ CH A/CH B	1 Hz	0.000	kHz
FREQ CH A/CH B	0.1 Hz	0.0000	kHz
PER	10^3 Hz	0.0000	μs
PER	10^2 Hz	0.000	μs
PER	10^1 Hz	0.00000	mS
PER	10^0 Hz	0.0000	mS
CHK	100 Hz	10.0000	MHz
CHK	10 Hz	10000.00	kHz
CHK	1 Hz	0000.000	kHz Overflow
CHK	0.1 Hz	000.0000	kHz Overflow
CHK	AUTO	10000.00	kHz
CHK & RESET	AUTO	88888.88	kHz
TOT	AUTO	0	kHz

Table 4-3. High Frequency Sensitivity Check (Channel A)

GENERATOR SETTING		DISPLAY READING ± GENERATOR STABILITY
FREQUENCY	LEVEL RMS	
10 MHz	15 mV	10000.00 kHz
50 MHz	15 mV	50000.00 kHz
100 MHz	15 mV	100.0000 MHz
125 MHz	25 mV	125.0000 MHz

4-20. Sensitivity Check (Channel-B)

1. Connect the high frequency generator and an RF millivoltmeter to the channel-B input via a high impedance T-connector.
2. Set the generator to about 50MHz at 75mV.
3. Energize the counter, depress the frequency B function switch and select 100 Hz resolution.
4. Make a note of the display reading and reduce the amplitude level of the generator until the display goes to zero. Increase the amplitude level until the counter reads correctly, the level at which the counter reads correctly should be less than 25 mV.
5. Repeat step-4 at 100MHz and 175MHz.
6. Repeat step-4 every 50MHz to 520MHz, note that the input level remains at less than or equal to 25mV with a clean dropout (i.e. a maximum of one noisy reading).

4-21. CALIBRATION

4-22. The 1912A multi-counter should be calibrated once a year or whenever a sensitivity check indicates that the instrument does not match the specifications. Calibration requires no more than the adjustment of the trigger level (channel-A) threshold adjustment (channel-B) and the time base adjustment.

4-23. Trigger/Hysteresis Level Adjustment (Channel-A)

4-24. The trigger level adjustment should be performed whenever repairs have been made to the input section of the counter. Perform the trigger/hysteresis level adjustment as follows:

1. Remove the instrument from its case.
2. Energize the counter (refer to #1 warning under general maintenance of Section-4) connect the high frequency generator and an RF millivoltmeter via a T-connector terminated into 50 Ω to the channel-A input.
3. Set the front panel trigger level control to the preset position.
4. Set the generator to 75 mV output level at about 100 MHz, note the display reading as a reference.
5. Set the hysteresis trimpot (R20) to its maximum clockwise position.
6. Reduce the input level until the display becomes unstable and then try to adjust R11 (internal trigger level, see figure 4-1) for the reference reading as noted in step-4.
7. Repeat step-6 until no additional sensitivity is possible.
8. Repeat sensitivity check channel-A. If counter does not meet this check turn the hysteresis trimpot (R20) counter-clockwise until all display limits as listed in table 4-3 are met.

NOTE

Oscillations of U1's outputs indicate that R20 has been adjusted too far counter-clockwise.

4-25. Threshold Adjustment (Channel-B)

1. Remove the unit from its case. Refer to warning under General Maintenance.
2. Set function switch to frequency channel-B and resolution to 100Hz.
3. Connect a high frequency generator and an RF millivoltmeter via a T-connector to the channel-B input.
4. Set the generator to about 250MHz at 20mV
5. Set the threshold trimpot (R19) on the 520MHz prescaler pcb to its maximum counter-clockwise position, see Figure 8-6.
6. Advance the trimpot (R19) clockwise until the display goes to zero. Then slowly advance the trimpot counter-clockwise until the display reads correctly.
7. Reduce the input amplitude and verify that the reading remains stable until going to zero (must be less than or equal to 25mV). Repeat step 6 and 7 until counter meets this specification.

8. Change the generator output to 50MHz at about 75mV. Reduce the amplitude level and verify that the display reading remains stable to below 25mV. If the display becomes erratic at a level greater than 25mV then R19 must be readjusted. The correct adjustment for R19 is for a clean dropout of readings when the input level is about 15mV at frequencies from 50MHz to 520MHz.

4-26. Time Base Adjustment (Standard Unit)

1. Allow the counter to operate for at least 30 minutes in the case to stabilize the internal temperature.
2. Select the frequency-A function and 1 Hz resolution.
3. Select a 10MHz output on the quartz oscillator and apply it to the channel-A input.
4. While observing the display adjust the time base oscillator control (C5) through the rear panel, see Figure 4-2, to obtain a reading of overflow 000000±5.

4-27. Time Base Calibration (Option —03 & —04)

1. Allow the counter to operate for at least 30 minutes in the case to stabilize the internal temperature.
2. Select the channel-A function at 1 Hz resolution.
3. Connect the 10MHz reference frequency to the channel-A input.

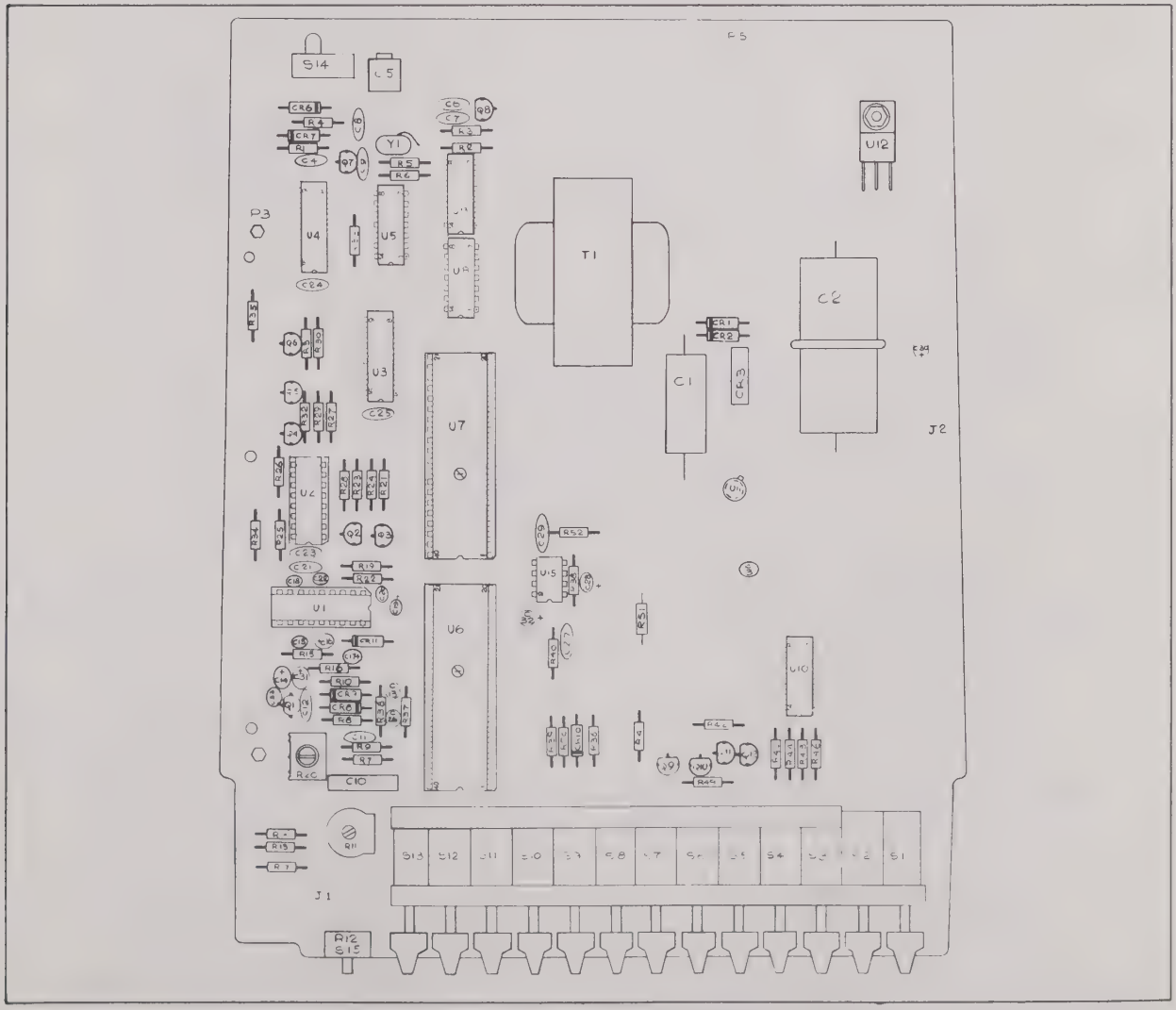


Figure 4-1. Main PCB (Top View)

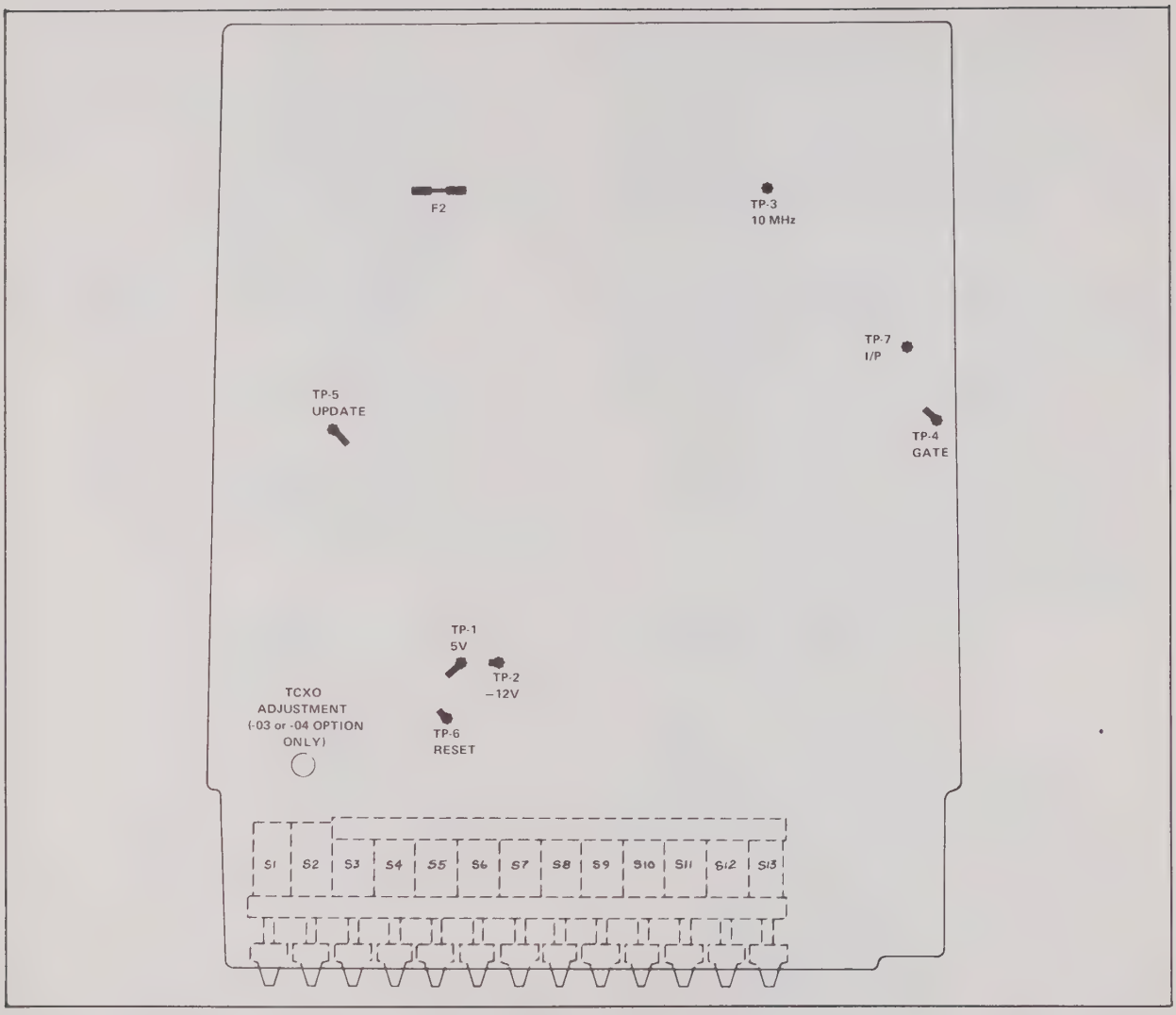


Figure 4-2. Main PCB (Bottom View)

4. Remove the unit from its case and immediately reconnect the line cord. Refer to warning under General Maintenance.

5. Using a nonconductive screwdriver, adjust the TCXO through the main pcb (see Figure 4-2.) to obtain a reading of (overflow) 000.0000 ±3 counts in the LSD.

6. Return unit to it's case, assure that reading remains constant.

4-28. TROUBLESHOOTING

⊗ CAUTION

Static discharge can damage MOS components contained in the 1912A.

4-29. When troubleshooting or repairing the 1912A use the following precautions to prevent damage from static discharge:

1. Never remove, install or otherwise connect or disconnect components without first turning the 1912A power switch to OFF, and disconnecting the line cord.

2. Perform all repairs at a static-free work station.

3. Do not handle IC's or pcb by their connectors.

4. Use static ground straps to discharge repair personnel.

5. Use conductive foam to store replacement of removed IC's.
6. Remove all plastic, vinyl and styrofoam products from the work area.
7. Use a grounded soldering iron.

4-30. The following discussion shall be used to isolate and correct any problems still existing after completion of the sensitivity and calibration procedures, for explanation of the symbols used see Figure 4-3. The entire troubleshooting procedure for the instrument is contained in four flowcharts. The first flowchart (Figure 4-4) troubleshoots the channel-A input section and it's associated circuitry. The second procedure (Figure 4-5) troubleshoots the channel-B input section (520 MHz prescaler). The third flow chart (Figure 4-6) details a self-check operation for the gating and divider circuitry. The last procedure (Figure 4-7) debugs the display and the two CMOS chips, U6 & U7.

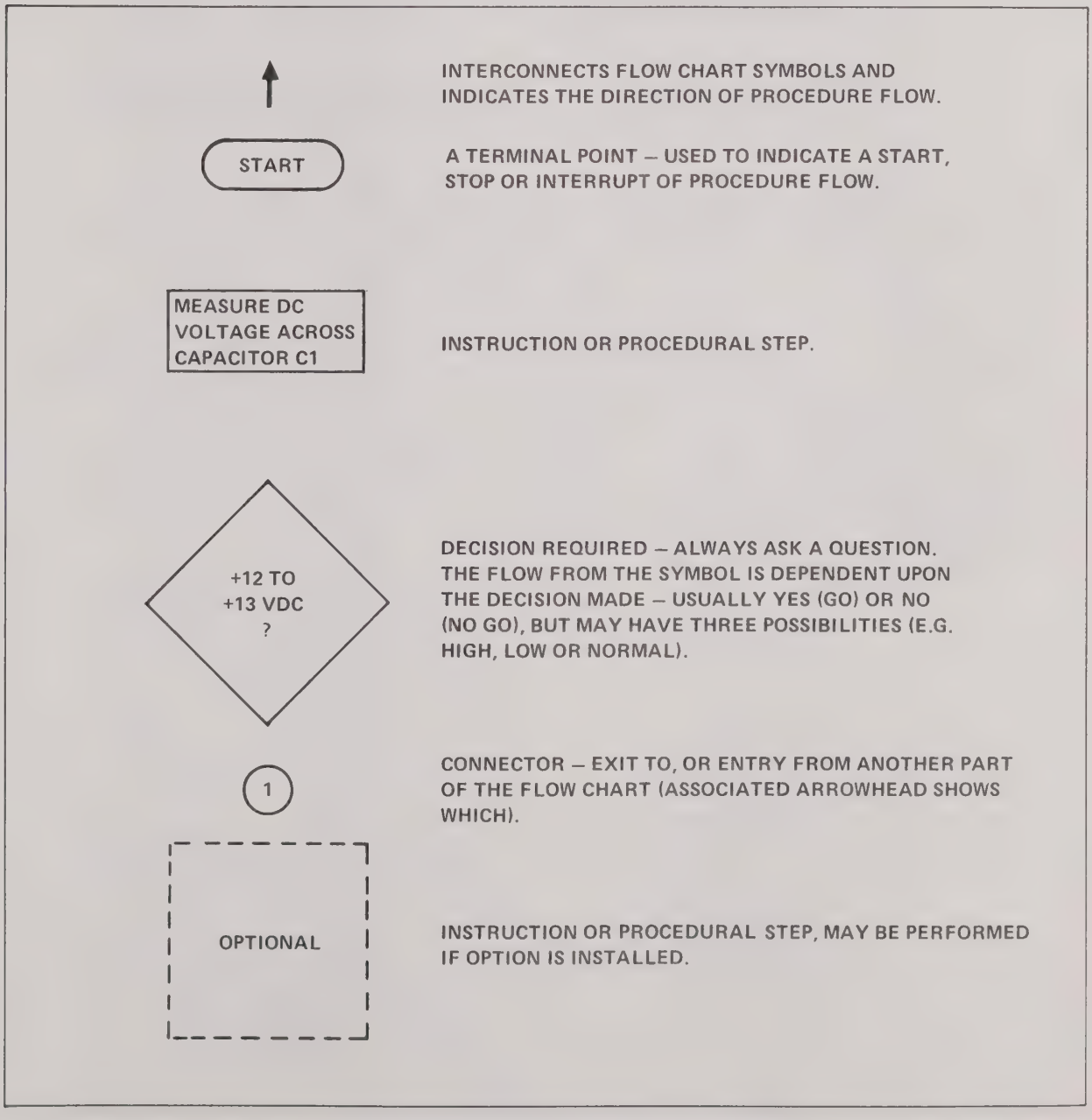

INTERCONNECTS FLOW CHART SYMBOLS AND INDICATES THE DIRECTION OF PROCEDURE FLOW.
START
A TERMINAL POINT – USED TO INDICATE A START, STOP OR INTERRUPT OF PROCEDURE FLOW.
MEASURE DC VOLTAGE ACROSS CAPACITOR C1
INSTRUCTION OR PROCEDURAL STEP.
+12 TO +13 VDC ?
DECISION REQUIRED – ALWAYS ASK A QUESTION. THE FLOW FROM THE SYMBOL IS DEPENDENT UPON THE DECISION MADE – USUALLY YES (GO) OR NO (NO GO), BUT MAY HAVE THREE POSSIBILITIES (E.G. HIGH, LOW OR NORMAL).
1
CONNECTOR – EXIT TO, OR ENTRY FROM ANOTHER PART OF THE FLOW CHART (ASSOCIATED ARROWHEAD SHOWS WHICH).
OPTIONAL
INSTRUCTION OR PROCEDURAL STEP, MAY BE PERFORMED IF OPTION IS INSTALLED.

Figure 4-3. Troubleshooting Flow Chart Symbols

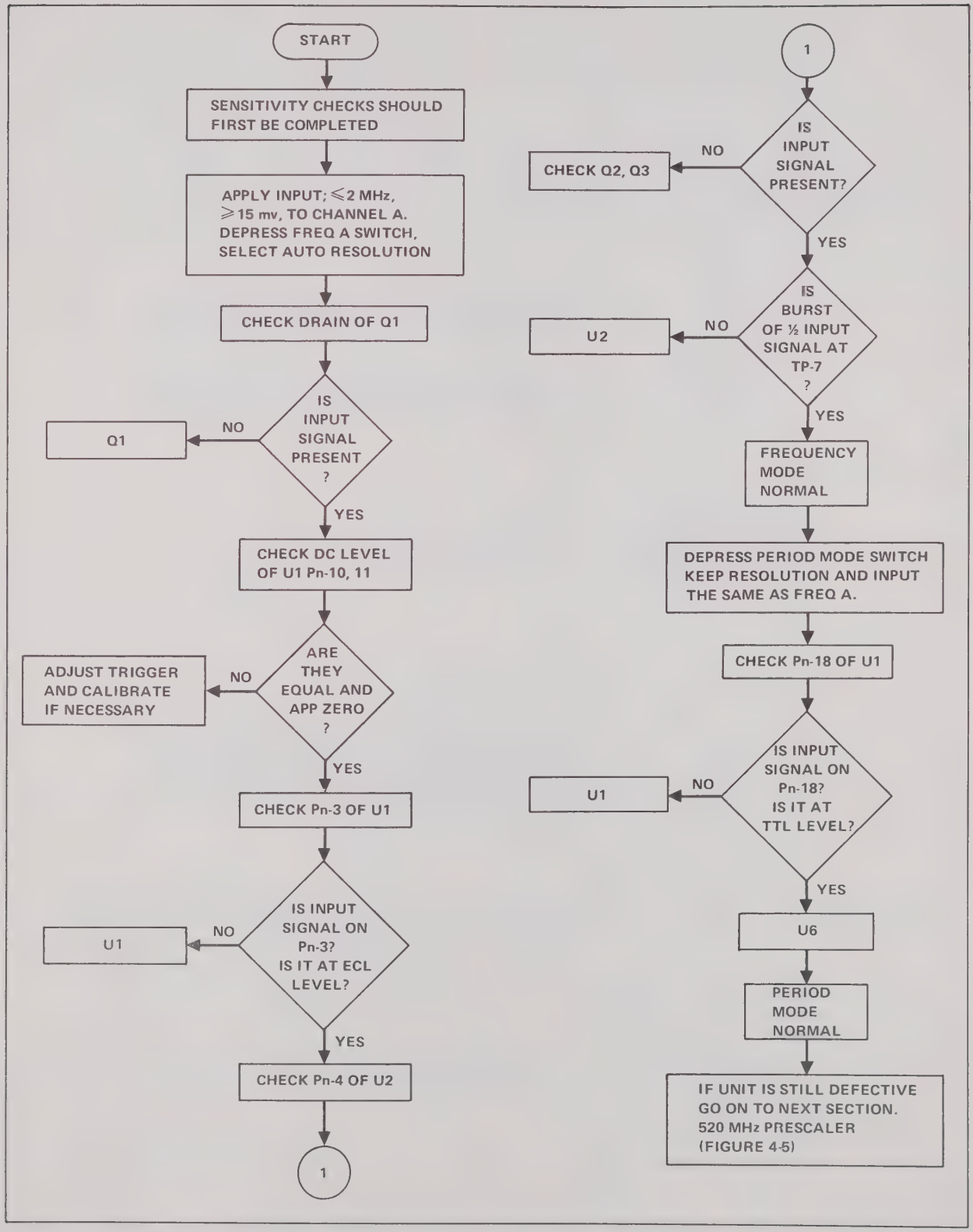
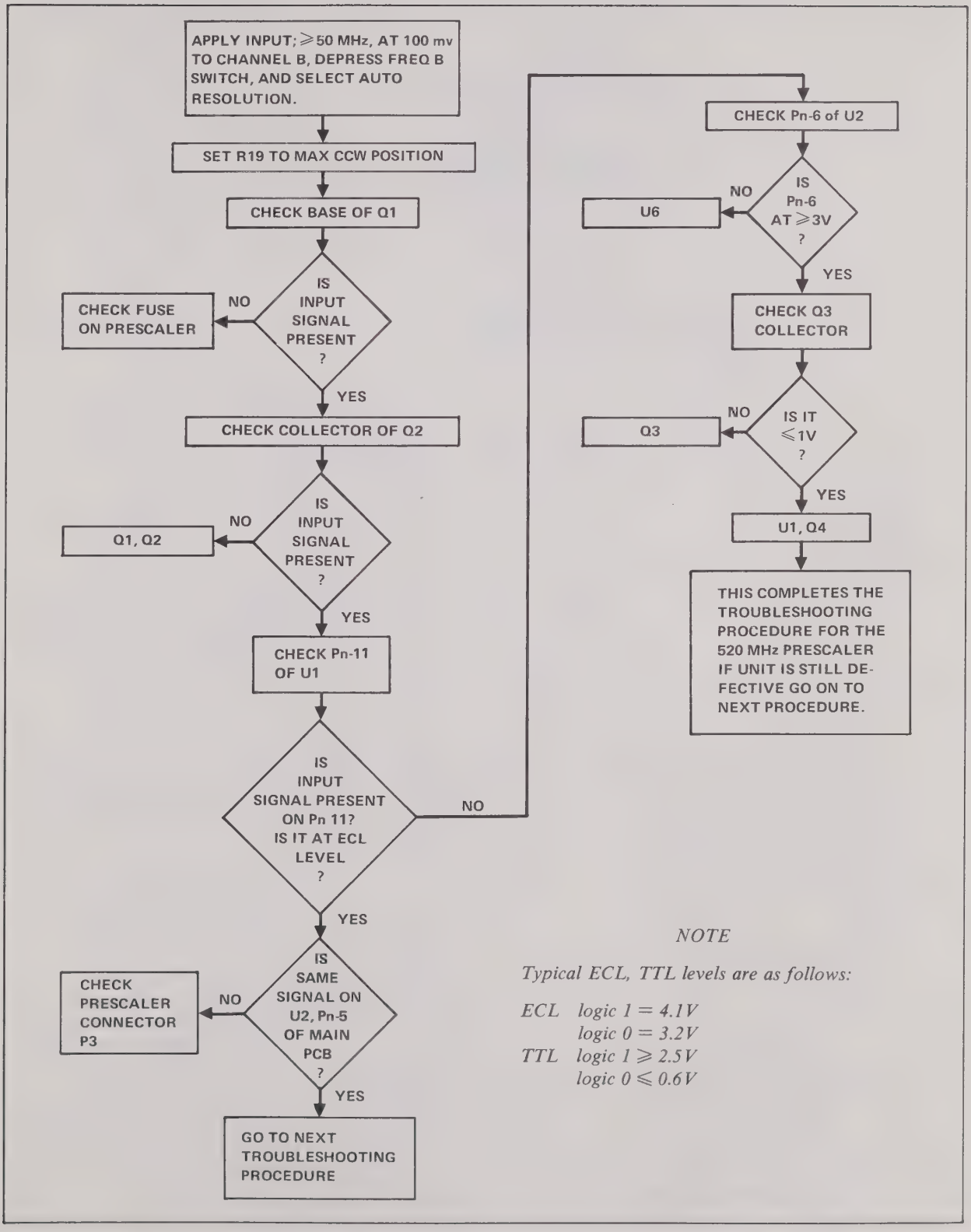


Figure 4-4. Troubleshooting Flow Chart, Input Section


APPLY INPUT; ⩾50 MHz, AT 100 mv TO CHANNEL B, DEPRESS FREQ B SWITCH, AND SELECT AUTO RESOLUTION.
SET R19 TO MAX CCW POSITION
CHECK BASE OF Q1
IS INPUT SIGNAL PRESENT ?
NO
CHECK FUSE ON PRESCALER
YES
CHECK COLLECTOR OF Q2
IS INPUT SIGNAL PRESENT ?
NO
Q1, Q2
YES
CHECK Pn-11 OF U1
IS INPUT SIGNAL PRESENT ON Pn 11? IS IT AT ECL LEVEL ?
NO
YES
IS SAME SIGNAL ON U2, Pn-5 OF MAIN PCB ?
NO
CHECK PRESCALER CONNECTOR P3
YES
GO TO NEXT TROUBLESHOOTING PROCEDURE
CHECK Pn-6 of U2
IS Pn-6 AT ⩾3V ?
NO
U6
YES
CHECK Q3 COLLECTOR
IS IT ⩽1V ?
NO
Q3
YES
U1, Q4
THIS COMPLETES THE TROUBLESHOOTING PROCEDURE FOR THE 520 MHz PRESCALER IF UNIT IS STILL DEFECTIVE GO ON TO NEXT PROCEDURE.

NOTE

Typical ECL, TTL levels are as follows:

ECL logic 1 = 4.1V
logic 0 = 3.2V
TTL logic 1 ⩾ 2.5V
logic 0 ⩽ 0.6V

Figure 4-5. Troubleshooting Flow Chart, 520 MHz Prescaler

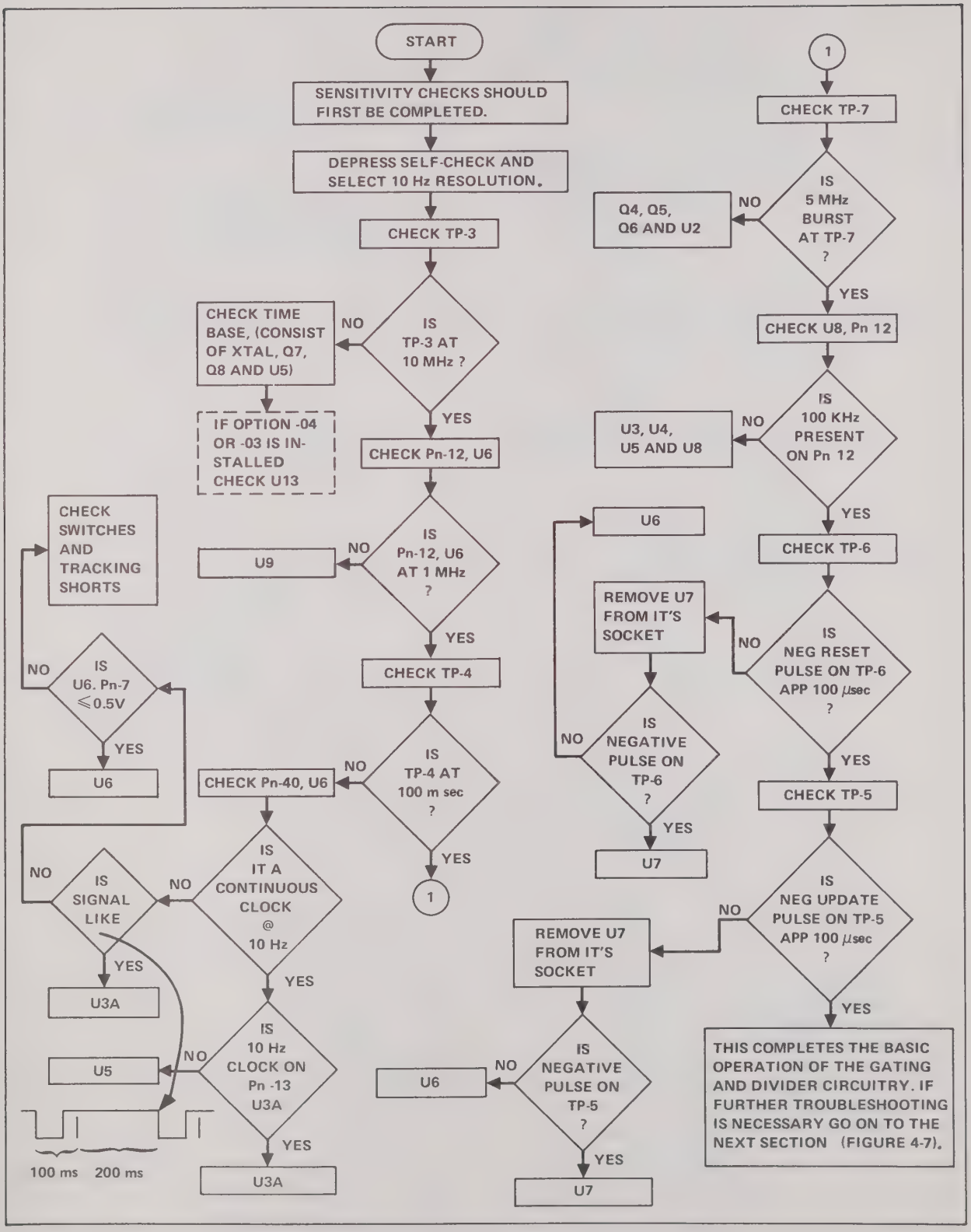


Figure 4-6. Troubleshooting Flow Chart, Timebase

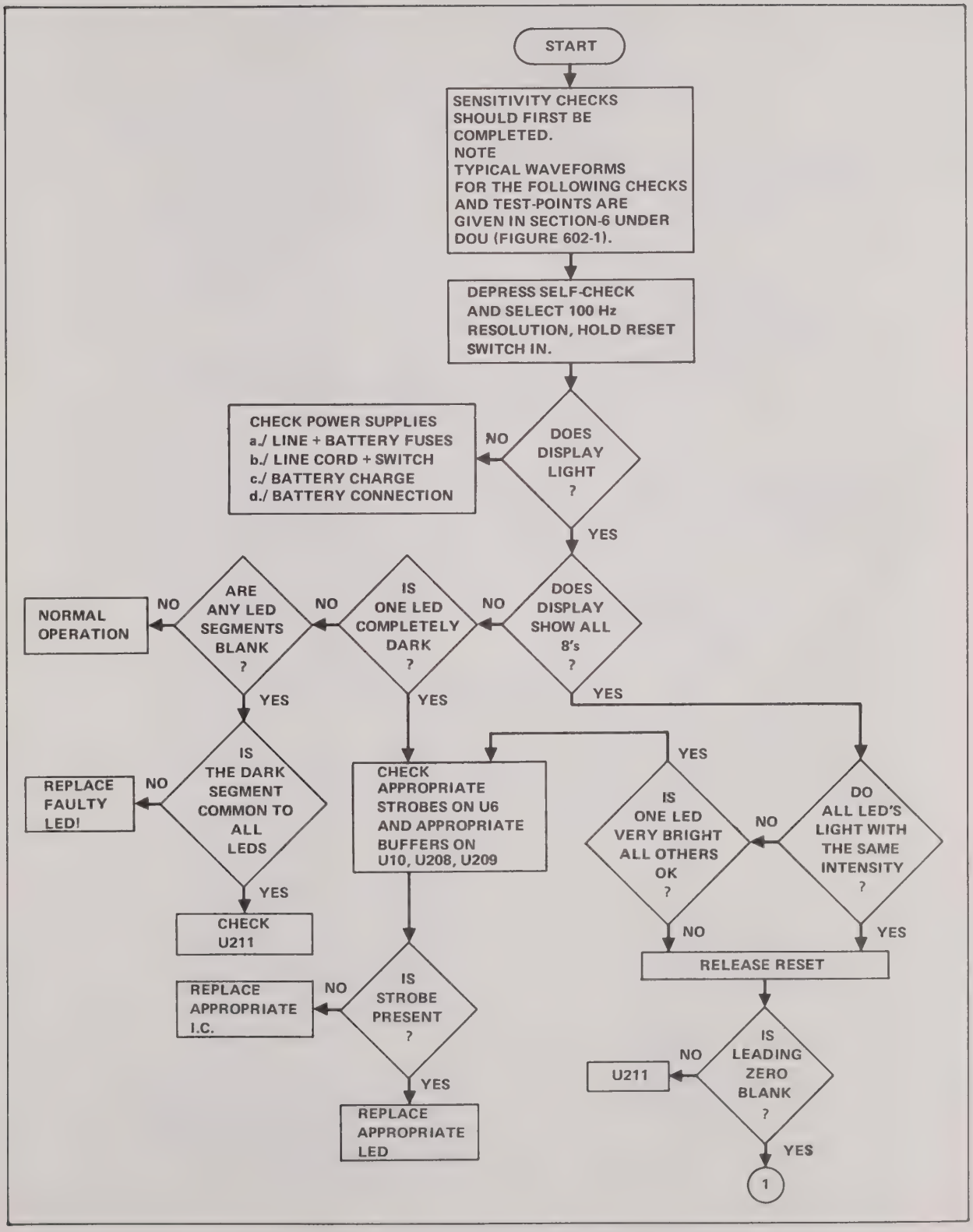


Figure 4-7. Troubleshooting Flow Chart, Display

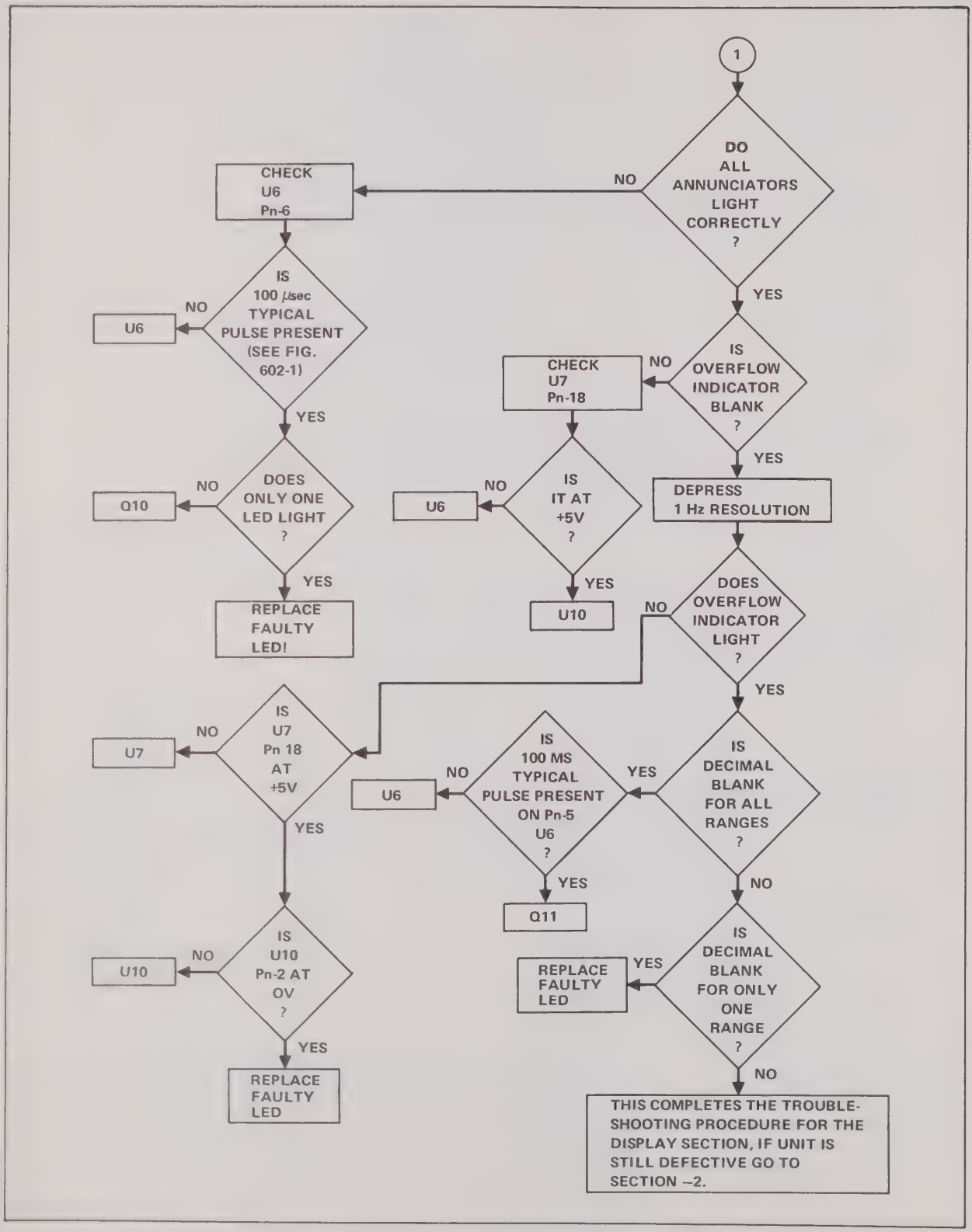


Figure 4-7. Troubleshooting Flow Chart, Display (Concluded)

Section 5
List of Replaceable Parts

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5-1. INTRODUCTION

5-2. This section contains an illustrated parts breakdown of the instrument. Components are listed alphanumerically by assembly. Electrical components are listed by item number. Each listed part is shown in an accompanying illustration.

5-3. Parts lists include the following information:

1. Reference Designation or Item Number to meet military specification.
2. Description of each part.
3. Fluke Stock Number.
4. Federal Supply Code for Manufacturers. (See Appendix A for Code-to-Name list).
5. Manufacturer's Part Number or Type.
6. Total Quantity per assembly or component.
7. Recommended Quantity: This entry indicates the recommending number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site. For maintenance for one year or more at an isolated site, it is recommended that at least one in each assembly in the instrument be stocked. In the case of optional sub-assemblies, plug-ins, etc., that are not always part of the instrument, or are deviations from the basic instrument mode, the REC QTY column lists the recommended quantity of the item in that particular assembly.

5-4. HOW TO OBTAIN PARTS

5-5. Components may be ordered directly from the manufacturer by using the manufacturer's part number, or from the John Fluke Mfg. Co., Inc. factory or authorized representative by using the FLUKE STOCK NUMBER. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. To ensure the prompt and efficient handling of your order, include the following information:

1. Quantity.
2. FLUKE Stock Number
3. Description
4. Reference Designation or Item Number
5. Printed Circuit Board Part Number
6. Instrument Model and Serial Number

⊗ CAUTION!

Indicates devices are subject to damage by static discharge.

Table 5-1. A1 Final Assembly (Line Power)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	FINAL ASSY LINE POWER, FIGURE 5-1	ORDER	MODEL	1912A	1		
A2	Ⓧ MAIN PCB ASSY.	ORDER	NEXT	HIGHER LEVEL	1		
	Ⓧ MAIN PCB ASSY,(100V SOURCE) 1912A-4010	ORDER	REQ	SOURCE			
	Ⓧ MAIN PCB ASSY(115/230V SOURCE)1912A-4001	ORDER	REQ	SOURCE			
H4	SCREW, PHP, 2.56 X 1/4	149534	89536	149534	6		
H5	SCREW, PHP, 6-32 X 3/8	152165	89536	152165	1		
H6	SCREW, THD, FORMING, 6-20 X 3/8	288266	89536	288266	2		
H7	WASHER, FLAT	340505	89536	340505	2		
H8	WASHER, LOCK, INTRNL TOOTH = 2	110676	89536	110676	2		
H9	KNOB, DECAL	347401	89536	347401	2		
H10	LINE CORD, W/INT CONN (NOT SHOWN)	343723	89536	343723	1		
H11	ADAPTOR, 100V (NOT SHOWN)	100222	89536	100222	1		
H12	SHIELD, BOTTOM	458869	89536	458869	1		
H13	SHIELD, TOP	459248	89536	459248	1		
H14	SPECIFICATION DECAL	454199	89536	454199	1		
MP1	BASIC CASE	458331	89536	458331	1		
MP2	FOOT PAD	338632	89536	338632	2		
MP3	HANDLE, MOLDED	330092	89536	330092	1		
U1	Ⓧ IC, WIDEBAND AMP (INSTALLED IN TEST)	429191	89536	429191	1	1	
U6	Ⓧ IC, P-MOS (INSTALLED IN TEST)	460063	89536	460063	1		
U7	Ⓧ IC, MOS (INSTALLED IN TEST)	380238	89536	380238	1		

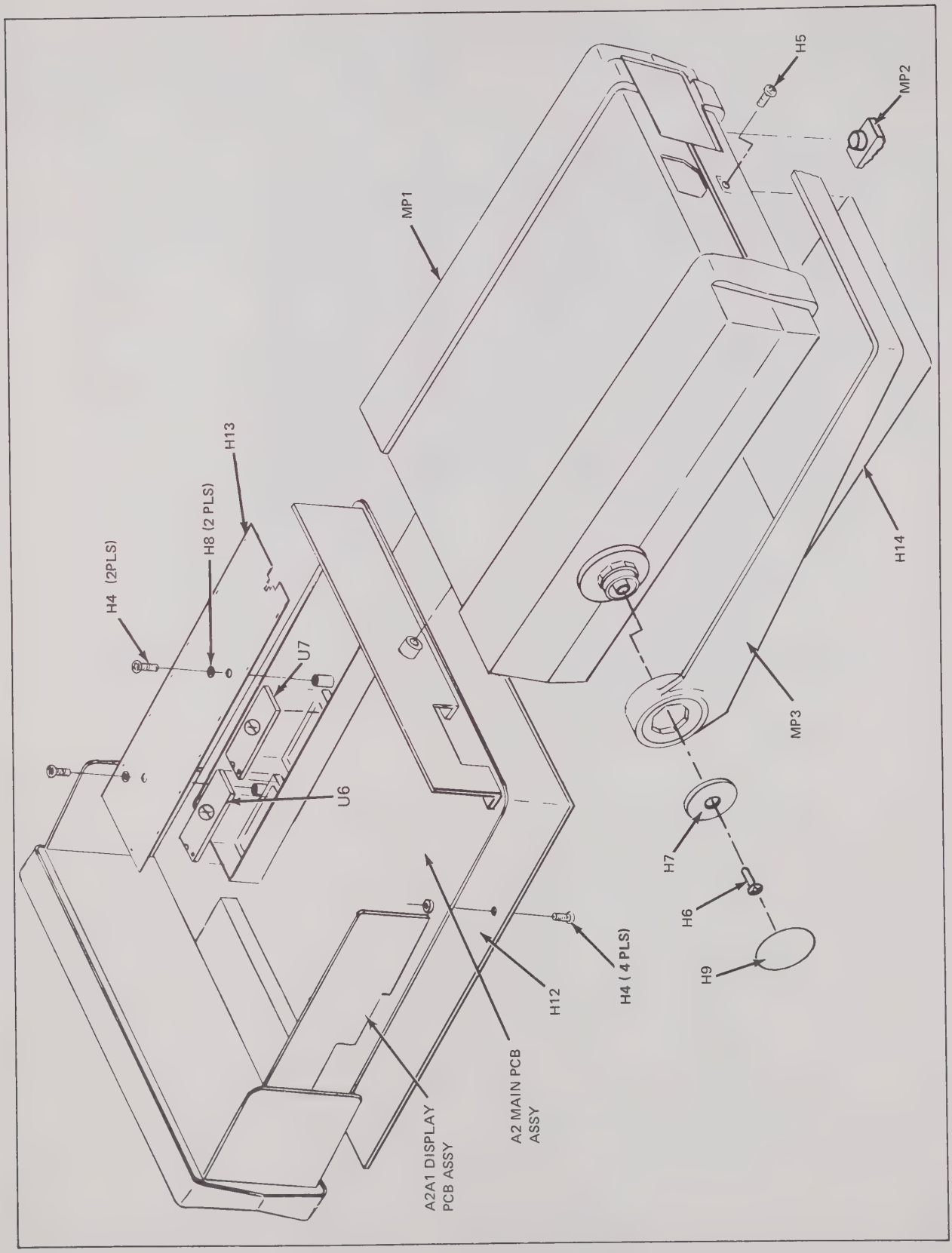

Figure 5-1. A1 Final Assembly (Line Power)

Table 5-2. A2 Main PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2	⊘ MAIN PCB ASSY, FIGURE 5-2	ORDER	NEXT	HIGHER LEVEL			
A2 A1	DISPLAY, PCB ASSY, 1910A-4020T	ORDER	NEXT	HIGHER LEVEL	1		
A2 A7	520 MHZ PRESCALER PCB ASSY, 1912A-4007T	458877	89536	458877	1		
C1	CAP, ELECT, 680 UF -10/+50%, 25V	218172	80031	ET681X025A02	1	1	
C2	CAP, ELECT, 5000 UF -10/+100%, 15V	379370	25008	B41010-5004/15	1	1	
C3	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	8		
C4	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	6		
C5	CAP, VAR, 7PF - 25PF, 350V	229948	72982	538-006B7-25	1		
C6	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	4		
C7	CAP, CER, 47 PF +/-20%, 1000V	369132	56289	C0309102H470J	1		
C8	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C9	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C10	CAP,PLYSTYRN FILM, 0.1UF +/-10%, 400V	447573	73445	C280M-F/A100K	1		
C11	CAP, CER, 100PF, +/-10%, 1KV	105593	71590	DD101	1		
C12	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C13	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C14	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	2		
C15	CAP, CER, 0.001 UF, +/-20%, 100V	401966	72982	8121-A100-W5R-102M	5		
C16	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C17	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C18	CAP, CER, 0.001 UF, +/-20%, 100V	401966	72982	8121-A100-W5R-102M	REF		
C19	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C20	CAP, CER, 0.001 UF, +/-20%, 100V	401966	72982	8121-A100-W5R-102M	REF		
C21	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C22	CAP, CER, 0.001 UF, +/-20%, 100V	401966	72982	8121-A100-W5R-102M	REF		
C23	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C24	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C25	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C26	CAP, TA, 1 UF, +/-20%, 35V	161919	56289	196D105X0025JA1	1		
C27	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C28	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C29	CAP, CER, 0.0012 UF, +/-10%, 500V	106732	71590	CF122	1		
C30	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	REF		
C31	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C32	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C33	CAP, CER, 0.001 UF +- 20%, 100V	401966	72982	8121-A100-W5R-102M	REF		
CR1	DIODE, SI, RECTIFIER	343491	04713	1N4002	2	1	
CR2	DIODE, SI, RECTIFIER	343491	04713	1N4002	REF		
CR3	RECTIFIER, BRIDGE	296509	09423	FB200	1	1	
CR6	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	3	1	
CR7	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR8	DIODE,LO-CAP	381806	07910	1N3062	2	1	
CR9	DIODE,LO-CAP	381806	07910	1N3062	REF		
CR11	DIODE, ZENER, 6.8 V	260695	07910	1N754A	1	1	
CR12	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
F1	FUSE 1/4A	109314	71400	AGC1-4	1	5	
H5	LUG,SOLDER	151431	79963	329	2		
H6	LUG, SOLDER	441972	79963	761	2		
H7	NUT, HEX 1/4-32	110601	73734	1/4-32NEF2B	1		
H8	NUT, HEX 4-40 X 1/4	110635	73734	8003NF	2		
H9	SCREW, PHP, 4-40 X 1/4	129890	73734	19022	4		
H11	SCREW, PHP, 6-32 X 3/16	381087	73734	19041	2		
H14	WASHER, INT LOCK #4	110403	73734	1302	3		
H22	TERMINAL PINS	376574	00779	3-87022-1	3		
J1	CONN, RECPTACLE, BNC	152033	95712	30355-1	2		
J2	CONN, RECPTACLE, BNC	152033	95712	30355-1	REF		
MP2	CABLE CLAMP (NOT SHOWN)	172080	06883	SST-1M	1		
MP3	DECAL, FRONT PANEL	454207	89536	454207	1		
MP4	DECAL, WARNING (NOT SHOWN)	386250	89536	386250	1		
MP12	TRANSIPAD (NOT SHOWN)	152207	07047	10123-DAP	1		
MP13	RETAINER	352484	77969	9109-E	2		
MP15	HOLDER, COMP (WITH C2)	104794	98159	2829-115-3	1		
MP16	KNOB, POINTER	448803	89536	448803	1		
MP17	LENS, FRONT	456582	89536	456582	1		
MP18	PANEL, FRONT	443283	89536	443283	1		

Table 5-2. A2 Main PCB Assembly (Continued)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
MP19	PANEL, REAR	443291	89536	443291	1		
MP21	SHEILD, WALL (NOT SHOWN)	459230	89536	459230	1		
Q1	XSTR, FET, JUNCTION, N-CHANNEL	288324	89536	288324	1	1	
Q2	XSTR FET, JUNCTION, N-CHANNEL	404277	89536	404277	1	1	
Q3	XSTR, SI, PNP	195974	04713	2N3906	4	1	
Q4	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q5	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q6	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q7	XSTR, SI, NPN	218396	04713	2N3904	5	1	
Q8	XSTR, FET, JUNCTION, N-CHANNEL	386094	89536	386094	1	1	
Q9	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q10	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q11	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q12	XSTR, SI, NPN	218396	04713	2N3904	REF		
R1	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	6		
R2	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	4		
R3	RES, DEP CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-4-5P2K7TS	3		
R4	RES, DEP CAR, 180 +/-5%, 1/4W	441436	80031	CR251-4-5P180ETS	2		
R5	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	5		
R6	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	9		
R7	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	REF		
R8	RES, DEP CAR, 150 +/-5%, 1/4W	343442	80031	CR251-4-5P150ETS	2		
R9	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	REF		
R10	RES, DEP CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-4-5P2K7TS	REF		
R11	RES, VAR, CAR, 10K +/- 20%, 0.20 W	369553	54869	PT10V-10K	1		
R13	RES, DEP CAR, 22K +/- 5% 1/4 W	348870	80031	CR251-4-5P22KTS	2		
R14	RES, DEP CAR, 150K +/- 5% 1/4 W	348938	80031	CR251-4-5P150KTS	1		
R15	RES, DEP CAR, 1.5 +/- 5% 1/4 W	343418	80031	CR251-4-5P1K5TS	2		
R16	RES, DEP CAR, 1.5 +/- 5%, 1/4W	343418	80031	CR251-4-5P1K5TS	REF		
R17	RES, DEP CAR, 22K +/-5%, 1/4W	348870	80031	CR251-4-5P22KTS	REF		
R19	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R20	RES, VAR, CERMET, 10K +/-5%, 1/4W	309674	89536	309674	1		
R21	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R22	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	3		
R23	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R24	RES, DEP CAR, 1.2K +/- 5%, 1/4 W	441378	80031	CR251-4-5P1K2TS	1		
R25	RES, DEP CAR, 270 +/- 5%, 1/4 W	348789	80031	CR251-4-5P270ETS	1		
R26	RES, DEP CAR, 220 +/- 5% 1/4 W	342626	80031	CR251-4-5P220ETS	1		
R27	RES, DEP CAR, 33 +/- 5% 1/4 W	414524	80031	CR251-4-5P33ETS	1		
R28	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R29	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R30	RES, DEP CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-4-5P2K7TS	REF		
R31	RES, DEP CAR, 150 +- 5%, 1/4W	343442	80031	CR251-4-5P150ETS	REF		
R32	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R33	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R34	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R35	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R36	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	REF		
R37	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	REF		
R38	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R39	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R40	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	REF		
R41	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R42	RES, DEP CAR, 27 +/- 5% 1/4 W	348763	80031	CR251-4-5P27ETS	2		
R43	RES, DEP CAR, 27 +/- 5% 1/4 W	348763	80031	CR251-4-5P27ETS	REF		
R44	RES, DEP CAR, 4.7K +/- 5%, 1/4 W	348821	80031	CR251-4-5P4K7TS	REF		
R45	RES, DEP CAR, 4.7K +/- 5%, 1/4 W	348821	80031	CR251-4-5P4K7TS	REF		
R46	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R48	RES, DEP CAR, 180 +/-5%, 1/4W	441436	80031	CR251-4-5P180ETS	REF		
R49	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R50	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R51	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	REF		
R52	RES, DEP CAR, 10K +/- 5%, 1/4 W	348839	80031	CR251-4-55P10KTS	REF		
S1 - S13	SWITCH ASSY (13 PART W/REMOVEABLE COVER)	429589	89536	429589	1		

Table 5-2. A2 Main PCB Assembly (Concluded)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
S1	SW, BUTTON, GREEN	445197	89536	445197	1		
S2	SW, BUTTON, BLUE	445205	89536	445205	1		
S3	SW, BUTTON, DARK GREY	426759	89536	426759	6		
S4	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S5	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S6	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S7	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S8	SW, BUTTON, LIGHT GREY	425900	89536	425900	5		
S9	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S10	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S11	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S12	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S13	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S14	SWITCH SLIDE	354878	95146	MSS22504	1		
T1	PWR, XFMR	ORDER	FOR	APPLICABLE SOURCE			
	XFMR, 115/230 V	463794	89536	463794	1		
	XFMR, 100 V	463810	89536	463810	1		
U1	Ⓐ SEE FINAL ASSY. ADDED IN TEST						
U2	IC, ECL EDGE-TRIG FLIP-FLOP	402743	12040	F95029DC	1	1	
U3	IC,TTL,DUAL,JK EDGE-TRIG FLIP-FLOP	363440	01295	SN74S112N	2	1	
U4	IC,TTL,DUAL,JK EDGE-TRIG FLIP-FLOP	363440	01295	SN74S112N	REF		
U5	IC, QUAD 2-INPUT, POS NOR GATES	288845	01295	SN7402N	1	1	
U6	Ⓐ SEE FINAL ASSY. ADDED IN TEST						
U7	Ⓐ SEE FINAL ASSY. ADDED IN TEST						
U8	IC, TTL, 50 MHZ DECADE COUNTER	320754	01295	SN74196N	1	1	
U9	IC, TTL, MSI DECADE COUNTER	402545	01295	SN74LS90N	1	1	
U10	IC, MOS-TO-LED, HEX/DIGIT/DRIVER	429506	12040	DS75492N	1	1	
U11	IC, LINEAR, 3-TERM NEG VOL REGULATOR	429514	07263	79M012HC	1	1	
U12	IC, LINEAR, V/REGULATOR	355107	04713	MC7805CP	1	1	
U15	IC, LINEAR, TIMER	402610	12040	LM555CN	1	1	
W1	CABLE ASSEMBLY	468983	89536	468983	1		
XF1	FUSE HOLDER, BAYONET CAP	460329	89536	460329	1		
XF2	INSERT, FUSE	ORDER	FOR	APPLICABLE SOURCE	1		
	INSERT, FUSE-GREY (100 V/115 V)	460238	89536	031-1666	1		
	INSERT, FUSE-BLACK (230 V)	461020	89536	031-11663	1		
XU1	SOCKET, IN, 18 PIN	413229	91506	318-AGC39D	1		
XU2	SOCKET, IC, 16 PIN	276535	91506	316-AGC39D	1		
XU6	SOCKET, IC 40 PIN	386060	09922	DILB40P-1	2		
XU7	SOCKET, IC 40 PIN	386060	09922	DILB40P-1	REF		
Y1	CRYSTAL 10 MHZ	385732	89536	385732	1		

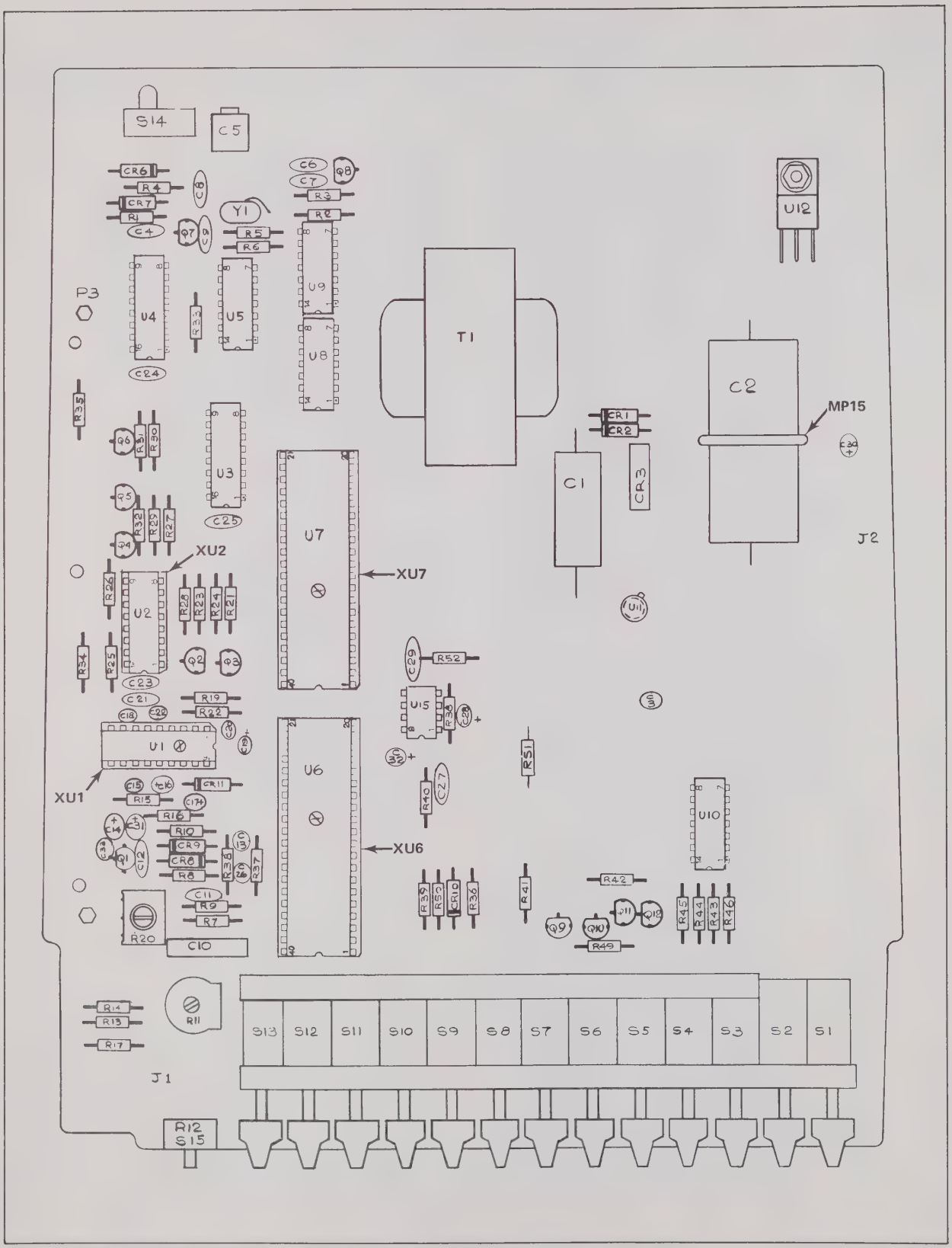

Figure 5-2. A2 Main PCB Assembly (Sheet 1 of 2)

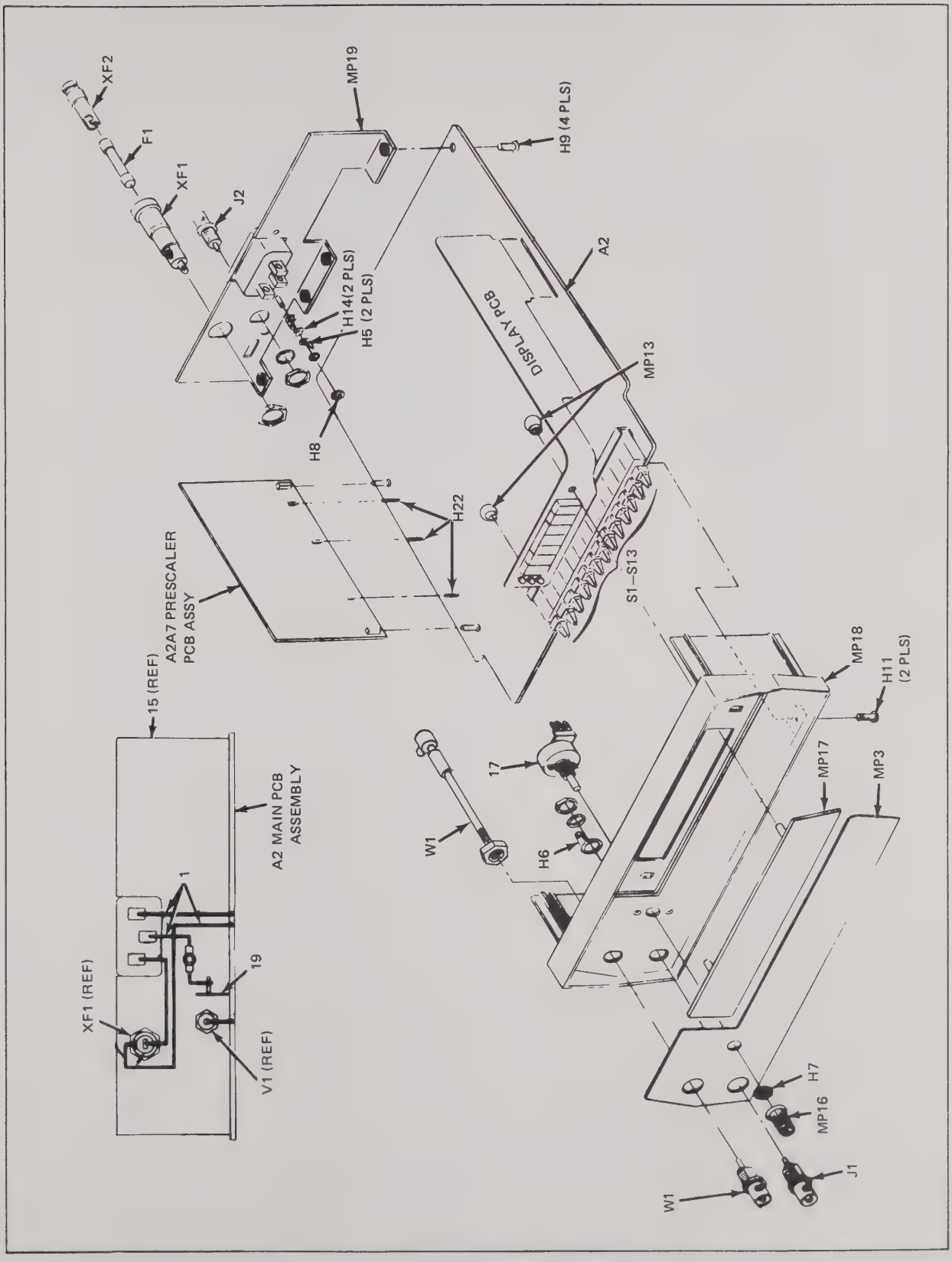

Figure 5-2. A2 Main PCB Assembly (Sheet 2 of 2)

Table 5-3. A2A1 Display PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2A1	DISPLAY PCB ASSY, FIGURE 5-3	ORDER	NEXT	HIGHER LEVEL			
CR201	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	4	1	
CR202	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	REF		
CR203	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	REF		
CR204	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	REF		
DS201	DIODE, LED, CLEAR	385898	28480	5082-4887	3	1	
DS202	DIODE, LED, CLEAR	385898	28480	5082-4887	REF		
DS203	DIODE, LED, CLEAR	385898	28480	5082-4887	REF		
U201	IC DISPLAY, LED	454249	28480	5082-7613	7	2	
U202	IC DISPLAY, LED	454249	28480	5082-7613	REF		
U203	IC DISPLAY, LED	454249	28480	5082-7613	REF		
U204	IC DISPLAY, LED	454249	28480	5082-7613	REF		
U205	IC DISPLAY, LED	454249	28480	5082-7613	REF		
U206	IC DISPLAY, LED	454249	28480	5082-7613	REF		
U207	IC DISPLAY, LED	454249	28480	5082-7613	REF		
U208	IC, MOS	429506	12040	DS75492N	1	1	
U209	IC, C-MOS, HEX/BUFF, INVERTER, 16 PIN	381830	02735	CD4050AE	1	1	
U210	IC, RES NETWORK, +/-5%, 14 PIN	412866	89536	412866	1	1	
U211	IC, C-MOS	429522	04713	MC14511CP	1	1	

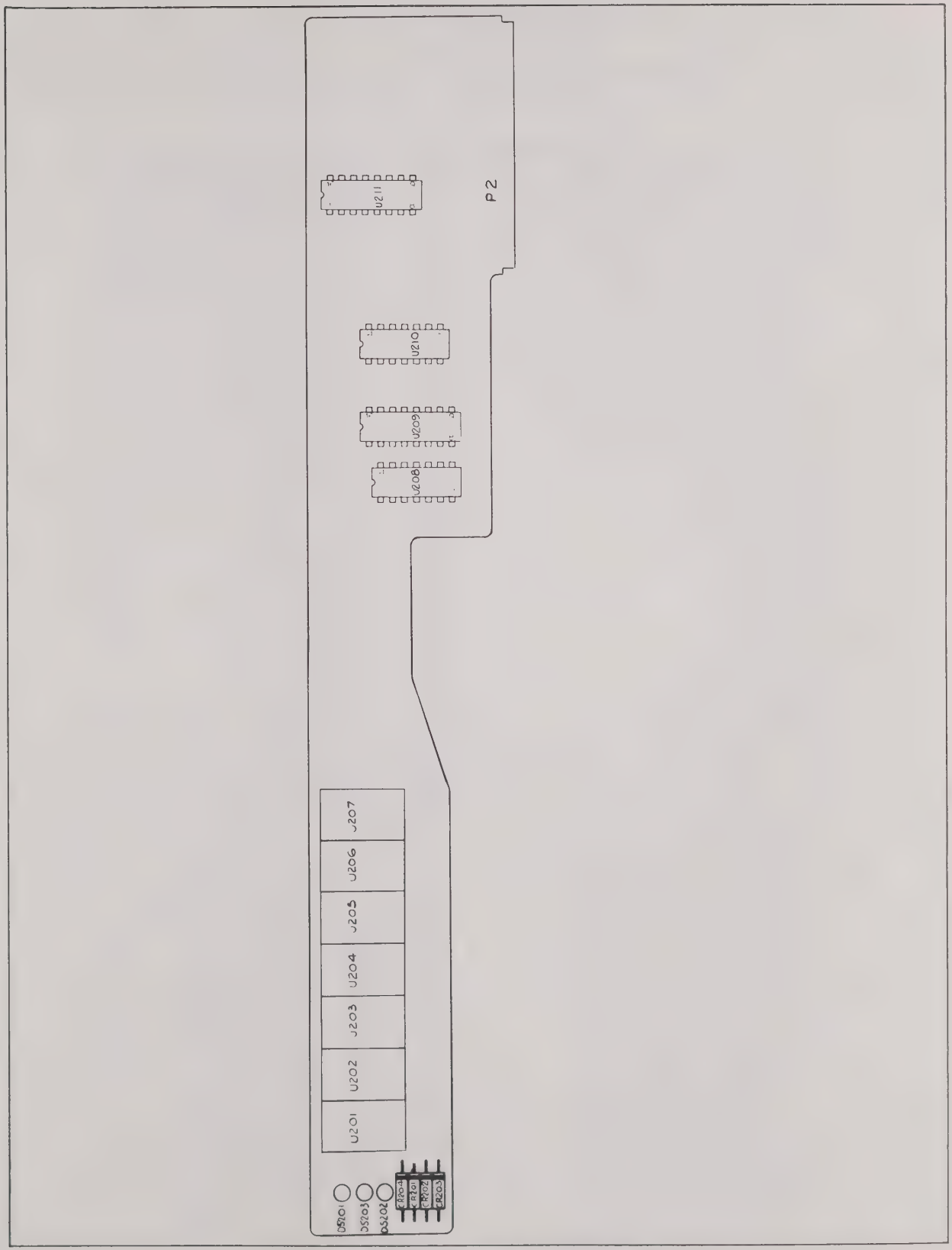

Figure 5-3. A2 A1 Display PCB Assembly

Table 5-4. A2A7 520 MHz Prescaler PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2A7	520 MHZ PRESCALER PCB ASSY, FIGURE 5-4	458877	89536	458877			
C1	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	7		
C2	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C3	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C4	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	7		
C5	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C6	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C7	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C8	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C9	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C10	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C11	CAP, MICA, 2PF +/-0.5PF, 500V	175208	72136	15C020K	1		
C12	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C13	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C14	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C15	CAP, CER, 0.05 UF +/-20/+80, 25V	148924	72982	5855-Y5U-502Z	1		
C16	CAP, TA 15 UF +/-20%, 6V	161935	56289	196D156X0006KA1	1		
C17	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	1		
C18	CAP, CER, 82 PF +/-10%, 500V	105585	72982	ED82	1		
C19	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
CR1	DIODE, HOT CARRIER	369595	07263	FH100	4	1	
CR2	DIODE, HOT CARRIER	369595	07263	FH100	REF		
CR3	DIODE, HOT CARRIER	369595	07263	FH100	REF		
CR4	DIODE, HOT CARRIER	369595	07263	FH100	REF		
F1	FUSE, 0.2 AMP	370577	75915	273.200	2	10	
F2	FUSE, 0.2 AMP, SPARE	370577	75915	273.200	REF		
J1	CONN, JACK, BLK	149112	74790	105-0753	2		
J2	CONN, RECPT	375329	00779	85863-3	3		
J3	CONN, RECPT	375329	00779	85863-3	REF		
J4	CONN, RECPT	375329	00779	85863-3	REF		
J5	CONN, JACK, BLK	149112	74790	105-0753	REF		
J12	CONN, COAX, SNAP-ON	352450	98291	51-051-0000	1		
L1	INDUCTOR, BEAD, 6 TURN	320911	89536	320911	4		
L2	INDUCTOR, BEAD, 6 TURN	320911	89536	320911	REF		
L3	INDUCTOR, BEAD, 6 TURN	320911	89536	320911	REF		
L4	INDUCTOR, BEAD, 6 TURN	320911	89536	320911	REF		
Q1	XSTR, HI-FREQ	454231	89536	454231	2	1	
Q2	XSTR, HI-FREQ	454231	89536	454231	REF		
Q3	XSTR, SI, NPN	218396	04713	2N3904	1	1	
Q4	XSTR, SI NPN	369645	04713	2N4274	1	1	
R1	RE, DEP CAR, 180 +/-5%, 1/4W	441436	80031	CR251-4-5P180ETS	1		
R2	RES, COMP, 27 +/-5%, 1/2W	260984	01121	EB2705	1		
R3	RES, DEP CAR, 6.2K +/-5%, 1/4W	442368	80031	CR251-4-5P6K2TS	2		
R4	RES, DEP CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-4-5P1K5TS	3		
R5	RES, DEP CAR, 100 +/-5%, 1/4W	348771	80031	CR251-4-5P100ETS	2		
R6	RES, DEP CAR, 160 +/-5%, 1/4W	441410	80031	CR251-4-5P160ETS	1		
R7	RES, DEP CAR, 51 +/-5%, 1/4W	414540	80031	CR251-4-5P51ETS	1		
R8	RES, DEP CAR, 270 +/-5%,1/4 W	348789	80031	CR251-4-5P-270ET	1		
R9	RES, DEP CAR, 6.2K +/-5%, 1/4W	442368	80031	CR251-4-5P6K2TS	REF		
R10	RES, DEP CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-4-5P1K5TS	REF		
R11	RES, DEP CAR, 100 +/-5%, 1/4W	348771	80031	CR251-4-5P100ETS	REF		
R12	RES, DEP CAR, 220 +/-5%, 1/4W	342626	80031	CR251-4-5P220ETS	1		
R13	RES, DEP CAR, 75 +/-5%, 1/4W	441642	80031	CR251-4-5P75ETS	2		
R15	RES, DEP CAR, 75 +/-5%, 1/4W	441642	80031	CR251-4-5P75ETS	REF		
R16	RES, DEP CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-4-5P1K5TS	REF		
R17	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	3		
R18	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R19	RES, VAR, CAR 10K +/-20%, 0.20W	385393	54869	PT10H(2.5)10K	1		
R20	RES, DEP CAR, 18K +/-5%, 1/4W	348862	80031	CR251-4-5P18KTS	1		
R21	RES, DEP CAR, 3.3K +/-5%, 1/4W	348813	80031	CR251-4-5P3K3TS	1		
R22	RES, DEP CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100KTS	2		
R23	RES, DEP CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100KTS	REF		
R25	RES, COMP, 22M +/-5%, 1/4 W	221986	01121	CB2255	1		
R26	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-5P10KTS	1		
R27	RES, DEP CAR, 330 +/-5%, 1/4 W	368720	80031	CR251-4-5P-330ET	1		

Table 5-4. A2A7 520 MHz Prescaler PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R28	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
U1	IC, DGTL, ECL, DIVIDE-BY-FOUR, COUNTER	402719	12040	11C05DC/11C05PC	1	1	
U2	IC, LIN, OP AMP	402750	12040	LM741CN	1		
XF1	RECEPTACLE, FUSE, SPRINGTYPE	403642	00779	50863-8	4		
XF2	RECEPTACLE, FUSE, SPRINGTYPE	403642	00779	50863-8	REF		
XU1	SOCKET, IC 14 PIN	276527	91506	314-AG39D	1		

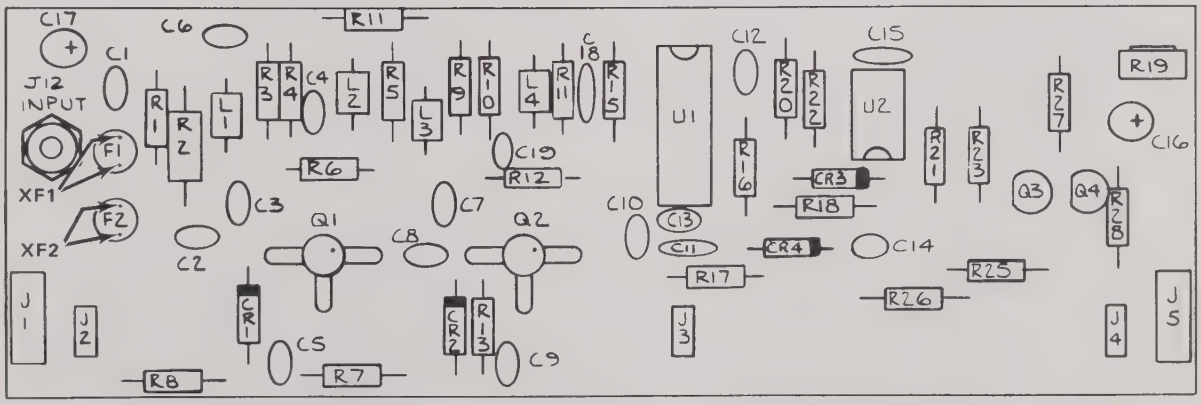

Figure 5-4. A2-A7 520 MHz Prescaler PCB Assembly

Section 6
Option & Accessory Information

6-1. INTRODUCTION

6-2. This section of the manual contains information pertaining to the accessories and options available for your instrument.

6-3. ACCESSORY INFORMATION

6-4. The accessory information, if applicable, will contain details concerning accessories that may be used with this particular instrument.

6-5. OPTION INFORMATION

6-6. Each of the options available for this instrument if any, are described separately under headings containing the option number. The option descriptions contain applicable operating and maintenance instructions and field installation procedures. A complete list of replaceable parts for each option is contained at the end of that option description.

TABLE OF CONTENTS

OPTION/ MODEL NO.	DESCRIPTION	PAGE NO.
	ACCESSORIES	600-1
	OPTIONS	600-1
—01	Battery Operation	601-1
—02	Data Output Unit	602-1
—03	Temperature Compensated Oscillator (TCXO)	603-1
—04	Superior Temperature Compensated Oscillator (TCXO)	603-1

Accessories

600-1. ACCESSORIES

600-2. Accessories for the Model 1912A are described in the following paragraphs. Refer to Section 1, Table 1-2, for the list of all accessories.

600-3. CARRYING CASE (C80)

600-4. The Model C80 Carrying Case, Figure 600-1, is a soft vinyl plastic container designed for the storage and transport of the 1912A. The case provides the multicounter with adequate protection against normal handling and storage conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

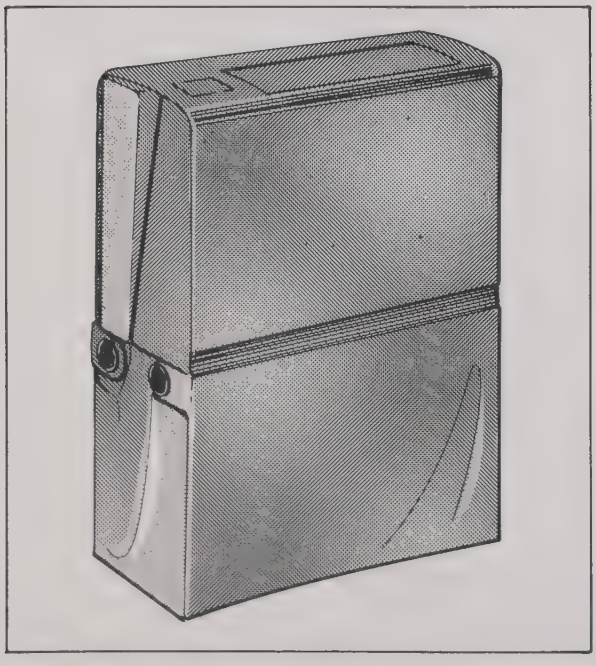

Figure 600-1. Model C80 Carrying Case

600-5. CARRYING CASE (C86)

600-6. The Model C86 Carrying Case, Figure 600-2, is a molded polyethylene container with handle designed for use in transporting the 1912A. This rugged case provides the counter with maximum protection against rough handling and adverse weather conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

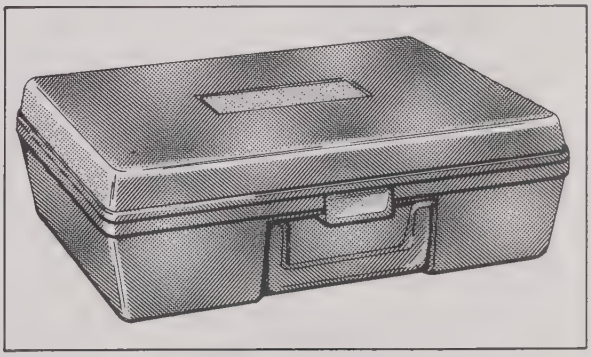

Figure 600-2. Model C86 Carrying Case

600-7. FRONT PANEL DUST COVER (MOO-100-714)

600-8. The front panel dust cover is a molded plastic snap-on accessory which fits over the front panel of the 1912A. The dust cover provides protection for the front panel controls, and is useful when storing or transporting the 1912A.

600-9. RACK MOUNTING KITS

600-10. Introduction

600-11. Three rack mounting kits are available for mounting the 1912A in a standard 19-inch equipment rack. The kits, listed in Table 600-1, provide the option of either offset mounting (left/right), center mounting or side-by-side mounting.

Table 600-1. Rack Mounting Kits

MOUNTING STYLE	MODEL NUMBER
Offset	MOO-200-611
Center	MOO-200-612
Side-By-Side	MOO-200-613

600-12. Installation Procedure

600-13. Installation instructions for each of the rack mounting kits is given in the following paragraphs. Use the procedure which corresponds to the model number of the kit being installed.

600-14. OFFSET AND CENTER MOUNTING KITS (MOO-200-611 & M00-200-612)

1. Remove the multi-counter carrying handle by removing the handle disc decals and the handle mounting screws.
2. Remove screw from rear of case and separate the case from the 1912A unit.
3. Install the side mounting brackets, as shown in Figure 600-3, 600-4 and secure them to the mounting panel using the nuts provided.
4. Insert the front of the multi-counter's case through the opening on the back side of the mounting panel.
5. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.
6. Slide the 1912A unit through the mounting panel and into the case. Install and tighten the retaining screw at the rear of the case.

600-15. SIDE-BY-SIDE MOUNTING KIT (MOO-200-613)

1. Remove the carrying handles from both instruments by removing the handle disc decals and the handle mounting screws (Figure 600-5).
2. Remove the retaining screw from the rear of the cases and separate the instruments from their cases.
3. Install the center mounting bracket, as shown in Figure 600-5, and secure it to the mounting panel using the nuts provided.
4. Install the clamp screw in the center mounting bracket using the nuts and washers provided.
5. Insert the front of the instrument cases through the openings on the back side of the mounting panel. Make sure the case's handle mounting bosses are inserted into the clamp hole of the center mounting bracket.
6. Tighten the clamp screw.
7. Install the side mounting brackets and secure them to the front panel using the nuts provided.
8. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.
9. Slide the instruments through the mounting panel and into their cases. Install and tighten the retaining screw at the rear of both cases.

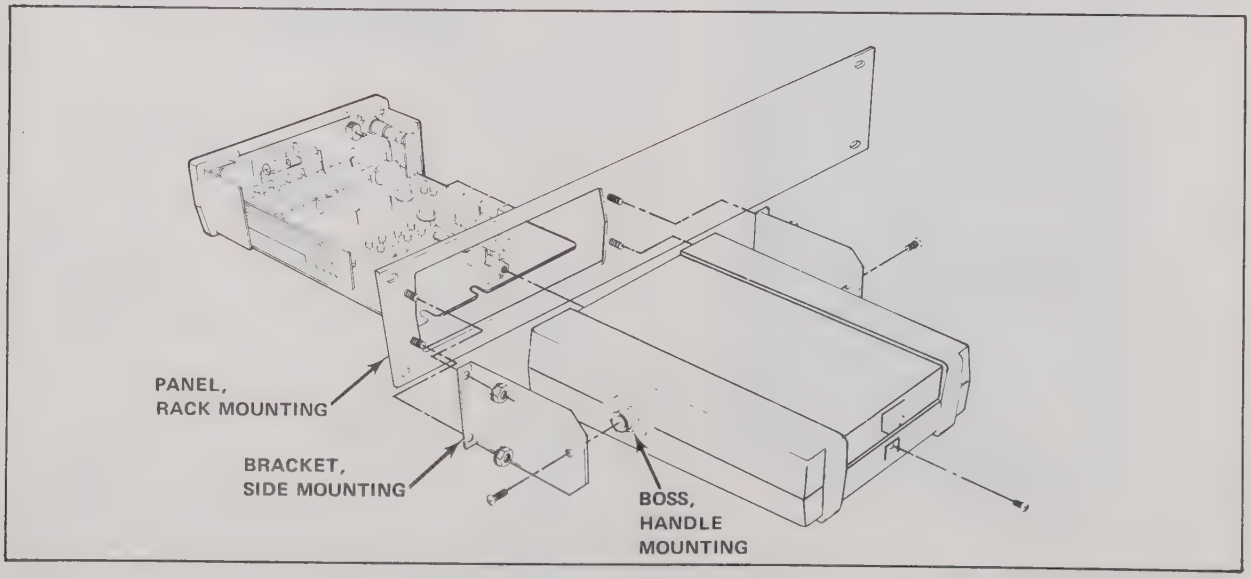

Figure 600-3. Rack Mounting Kit, Offset Mounting

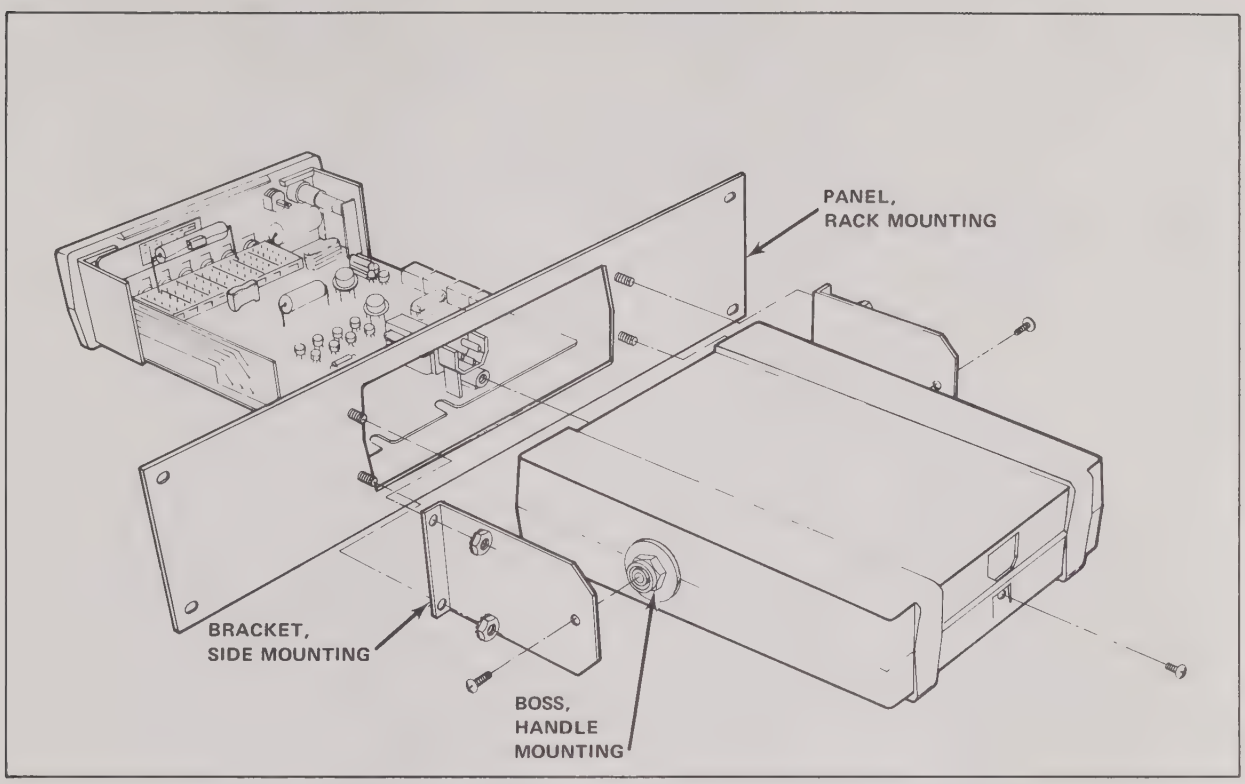

Figure 600-4. Rack Mounting Kit, Center Mounting

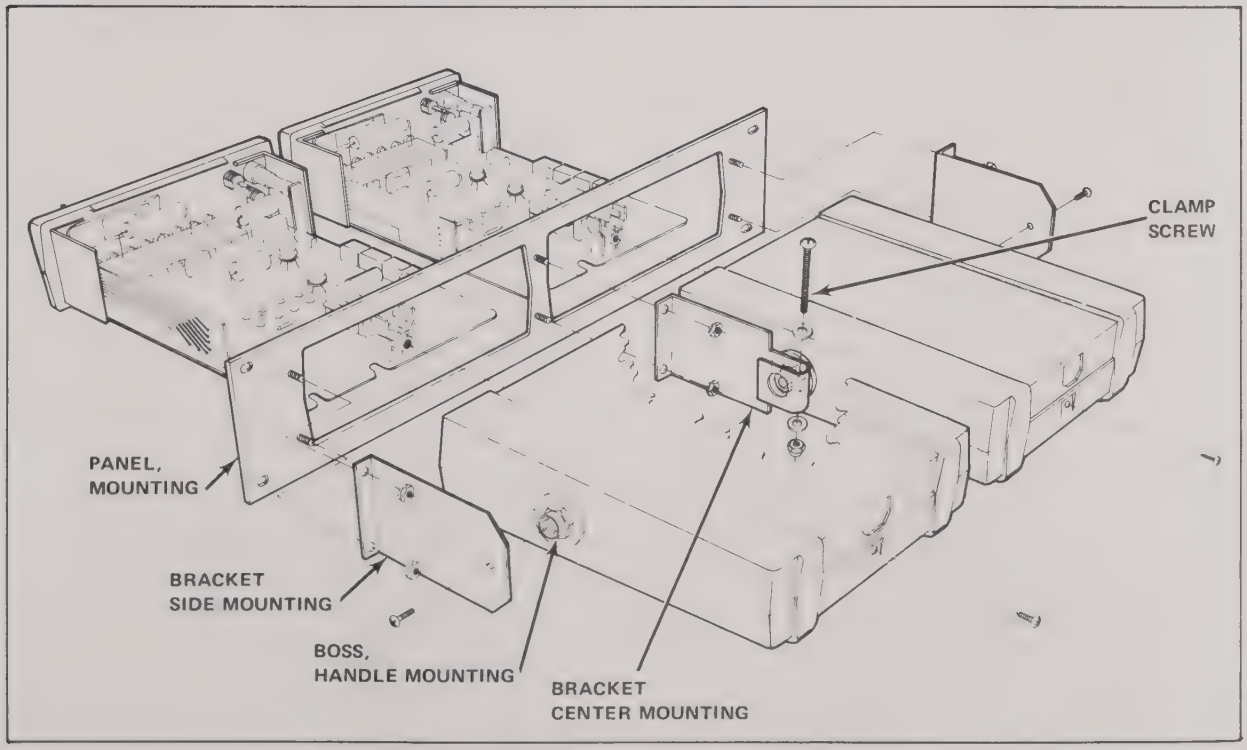

Figure 600-5. Rack Mounting Kit, Side-By-Side Mounting

Option —01
Battery Pack

WARNING

WHEN THE COUNTER IS OPERATING FROM THE BATTERY PACK THE UNIT WILL HAVE NO GROUND REFERENCE AND INPUT TO THE COUNTER MUST BE LIMITED TO A MAX. OF 30V.

601-1. INTRODUCTION

CAUTION

Any attempt to charge alkaline, zinc-carbon, or mercury batteries may damage the instrument.

601-2. Power for the instrument with the —01 option installed is supplied by internal rechargeable batteries that allow the instrument to operate for at least four hours. The batteries should be recharged after every four hours of operation or when the input sensitivity falls below specifications. Recharging is most rapidly accomplished by connecting the counter to the line and depressing the POWER switch to the STBY position. In this way, the discharged batteries can be completely recharged in approximately 16 hours. The instrument can be operated while recharging, however the recharging time will be significantly extended.

NOTE

Battery manufacturers recommend that nickel-cadmium batteries not be stored for extended periods of time without recharging at least every 90 days.
Storage temperature below 25° C is recommended.

601-3. Input Power (—01 Option)

601-4. To enable the unit to be compatible with international line voltages and frequencies it has been designed to operate from the following configurations: 100V 48-52, 58-62 Hz, 115V 58-62 Hz, and 230V 48-52 Hz. Therefore for battery charging purposes, the AC PCB 601-4 unique for that particular line voltage and frequency must be used (See AC PCB Parts List, and schematic Section 6). These modifications shall be initiated by ordering the battery option and specifying the line voltages and frequencies the unit shall be operated from.

601-5. AC PCB

601-6. The AC PCB modifies the main PCB —01, such that the unit is capable of charging the batteries from the various input voltages and frequencies. Basically the circuit is a constant current source determined by the value of the input capacitor C601.

601-7. Inverter PCB

601-8. The inverter PCB is a DC converter used to change the +5V battery output to -12V (a level compatible with all input power configurations).

601-9. BATTERY & FUSE REPLACEMENT

CAUTION

Disconnect the instrument from the input line power before removing batteries.

601-10. The procedure described below provides step-by-step instructions for replacing the batteries.

1. Disconnect the line power cord. Remove retainer screw from the rear of instrument's case, and remove instrument from case.

2. On the underside of the main PCB, remove two threaded bolts securing battery holders in place.

3. Remove holder tops and batteries

4. Replace batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries adhering to polarity indications on main PCB.

NOTE

Use 1.2 volt nickel-cadmium batteries only.

601-11. The procedure described below provides step-by-step instructions for replacing the battery fuse.

1. Disconnect line power cord. Remove retainer screw from rear of instrument case, and remove instrument from its case.

2. Remove bottom shield.

3. The fuse is located directly on the underside of the main pcb. It is clearly marked (Fuse), and may be checked visually.

4. Replace fuse if necessary by ordering: Part No. 167312.

Table 601-1. A1 Final Assembly (Battery Power)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	FINAL ASSY BATTERY POWER, FIGURE 601-1	ORDER	1912A	-01,SEE AC PCB			
A2	Ⓢ MAIN PCB ASSEMBLY, 1910A-4011	ORDER	NEXT	HIGHER LEVEL			
A3	INVERTER PCB ASSEMBLY, 1910A-4004T	443333	89536	443333	1		
A4	AC PCB ASSEMBLY BATTERY OPTION	ORDER	FOR	APPLICABLE SOURCE			
	115V BATTERY OPTION,58-62 HZ,1910A-4006T	456251	89536	456251	1		
	230V BATTERY OPTION,48-52 HZ,1910A-4013T	459362	89536	459362			
	100V BATTERY OPTION,42-58 HZ,1910A-4012T	459370	89536	459370			
	100V BATTERY OPTION,58-62 HZ,1910A-4014T	463309	89536	463307			
H4	SCREW, PHP, 2-56X1/4	149534	89536	149534	6		
H5	SCREW, PHP, 6-32X3/8	152165	89536	152165	1		
H6	SCREW, THD, FORMING, 6-20 X 3/8	288266	89536	288266	2		
H7	WASHER, FLAT	340505	89536	340505	2		
H8	WASHER, INT LOCK #2	110676	89536	110676	2		
MP1	CASE, BASIC	458331	89536	458331	1		
MP2	FOOT, PAD	338632	89536	338632	2		
MP3	HANDLE, MOLDED	330092	89536	330092	1		
MP9	KNOB, DECAL	347401	89536	347401	2		
MP11	PLUG-IN ADAPTOR, 100V (NOT SHOWN)	100220	89536	100220	1		
MP12	SHIELD, BOTTOM	458869	89536	458869	1		
MP13	SHIELD, TOP	459248	89536	459248	1		
MP14	DECAL, SPEC. (NOT SHOWN)	454199	89536	454199	1		
MP15	DECAL, WARNING (NOT SHOWN)	454546	89536	454546	1		
U6	Ⓐ IC, P-MOS PROGRAMAR	460063	89536	4660063	1		
U7	Ⓐ IC, MOS 7 DIGIT, 2.5 MHZ, DECI/CTR	380238	89536	380238	1		
W10	LINE CORD W/INT. CONN (NOT SHOWN)	343723	89536	343723	1		

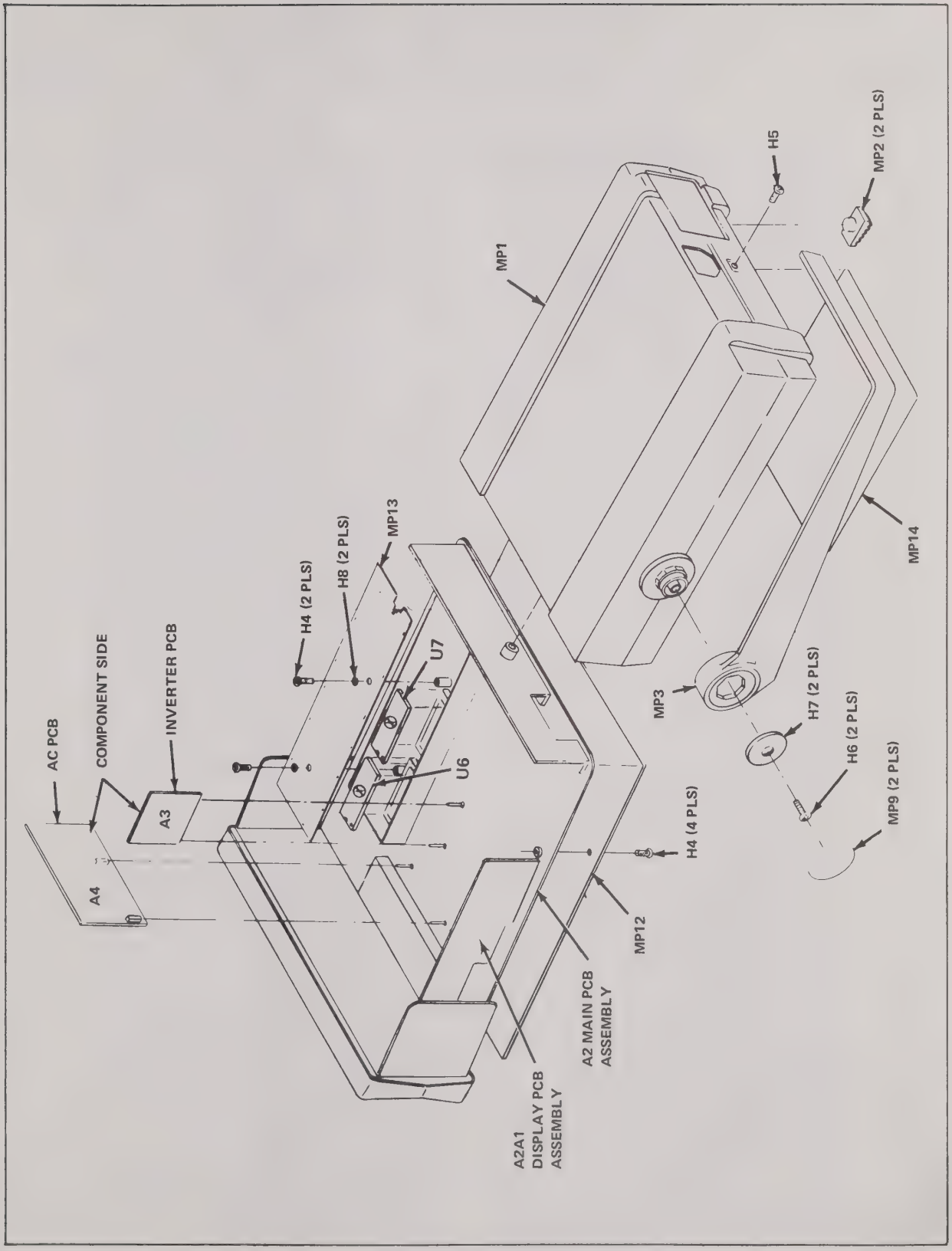

Figure 601-1. A1 Final Assembly (Battery Power)

Table 601-2. A2 Main PCB Assembly (Battery)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2	Ⓐ MAIN PCB ASSEMBLY BATTERY FIGURE 601-2	ORDER	NEXT	NEXT HIGHER LEVEL			
A2 A1	DISPLAY, PCB ASSY, SEE SECTION 5						
A2 A7	520 MHZ PRESCALER PCB ASSY, SEE SECT 5	458877	89536	458877	1		
BT1	BATTERY, NI-CAD	346924	06001	41B004A015	4	4	
BT2	BATTERY, NI-CAD	346924	06001	41B004A015	REF		
BT3	BATTERY, NI-CAD	346924	06001	41B004A015	REF		
BT4	BATTERY, NI-CAD	346924	06001	41B004A015	REF		
C1	CAP, ELECT, 10,000 UF -10/+100%, 6V	387241	25088	B41010/100006	1	1	
C4	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	7		
C5	CAP, VAR, 7PF - 25PF, 350V	229948	72982	538-006B7-25	1		
C6	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	4		
C7	CAP, CER, 47 PF +/-20%, 1000V	369132	56289	C030B102H470J	1		
C8	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C9	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C10	CAP,PLYSTYRN FILM, 0.1UF +/-10%, 400V	447573	73445	C280M-F/A100K	1		
C11	CAP, CER, 100PF, +/-10%, 1KV	105593	71590	DD101	1		
C12	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C13	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	7		
C14	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	2		
C15	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	5		
C16	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C17	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C18	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C19	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C20	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C21	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C22	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C23	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C24	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C25	CAP, CER 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C26	CAP, TA, 1 UF, +/-20%, 35V	161919	56289	196D105X0025JA1	1		
C27	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C28	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C29	CAP, CER, 0.0012 UF, +/-10%, 500V	106732	71590	CF122	1		
C30	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	REF		
C31	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C32	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KA1	REF		
C33	CAP, CER, 0.001 UF +- 20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
CR1	DIODE, SI, RECTIFIER	343491	04713	1N4002	2	1	
CR2	DIODE, SI, RECTIFIER	343491	04713	1N4002	REF		
CR6	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	3	1	
CR7	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR8	DIODE,LO-CAP	381806	07910	1N3062	2	1	
CR9	DIODE,LO-CAP	381806	07910	1N3062	REF		
CR11	DIODE, ZENER, 6.8 V	260695	07910	1N754A	1	1	
CR12	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	REF		
F1	FUSE, SLO-ACTING, 1/2 A	109322	71400	MDL1-2	1	5	
F2	WIRE (USED AS A FUSE, NOT SHOWN)	167312	89536	167312	AR		
H6	LUG, SOLDER	151431	79963	329	2		
H7	LUG, SOLDER	441972	79963	761	2		
H8	NUT, HEX, 1/4-32	110601	89536	110601	1		
H9	NUT, HEX, 4-40	110635	89536	110635	2		
H10	NUT, HEX 6-32	110551	89536	110551	2		
H11	SCREW, PHP, 4-40 X 3/16	129882	89536	129882	4		
H12	SCREW, 6-32 X 1.56	347427	89536	347427	2		
H13	SCREW, 6-32 X 3/16	381087	89536	381087	2		
H14	WASHER, INT LOCK #4	110403	89536	110403	3		
J1	CONN, BNC	152033	95712	30355-1	2		
J8	CONN, BNC,	398461	89536	398461	1		
MP1	ABSORBANT DISC.	458653	89536	458653	2		
MP2	ABSORBANT PAD	458661	89536	458661	2		
MP3	CABLE CLAMP (NOT SHOWN)	172080	06383	SST-1M	1		
MP4	DECAL, FRONT PANEL	454363	89536	454363	1		
MP5	DECAL, XFMR, WARNING	386250	89536	386250	1		
MP15	HOLDER, BATTERY	390450	89536	390450	4		
MP16	HOLDER, COMPONENT, RUBBER (TO C2)	104794	98159	2829-115-3	1		

Table 601-2. A2 Main PCB Assembly (Battery) (Continued)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
MP17	KNOB, POINTER	448803	89536	448803	1		
MP18	LENS, FRONT	456582	89536	456582	1		
MP19	PANEL, FRONT	443283	89536	443283	1		
MP20	PANEL, REAR	443291	89536	443291	1		
MP22	RETAINER	352484	77969	4109E	2		
MP23	SHIELD WALL	459230	89536	459230	1		
MP24	TERMINAL, PINS	376574	00779	3-87022-1	7		
MP25	PIN, GUIDES	375840	89536	375840	6		
MP27	CONTACT BATTERY (TO BT1-BT4)	344200	89536	344200	8		
Q1	XSTR, FET, JUNCTION, N-CHANNEL	288324	89536	288324	1	1	
Q2	XSTR FET, JUNCTION, N-CHANNEL	404277	89536	404277	1	1	
Q3	XSTR, SI, PNP	195974	04713	2N3906	4	1	
Q4	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q5	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q6	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q7	XSTR, SI, NPN	218396	04713	2N3904	5	1	
Q8	XSTR, FET, JUNCTION, N-CHANNEL	386094	89536	386094	1	1	
Q9	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q10	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q11	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q12	XSTR, SI, NPN	218396	04713	2N3904	REF		
R1	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	6		
R2	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	4		
R3	RES, DEP CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-4-5P2K7TS	3		
R4	RES, DEP CAR, 180 +/-5%, 1/4W	441436	80031	CR251-4-5P180ETS	2		
R5	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	5		
R6	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	9		
R7	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	REF		
R8	RES, DEP CAR, 150 +/-5%, 1/4W	343442	80031	CR251-4-5P150ETS	2		
R9	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	REF		
R10	RES, DEP CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-4-5P2K7TS	REF		
R11	RES, VAR, CAR, 10K +/- 20%, 0.20 W	369553	54869	PT10V-10K	1	1	
R13	RES, DEP CAR, 22K +/- 5% 1/4 W	348870	80031	CR251-4-5P22KTS	2		
R14	RES, DEP CAR, 150K +/- 5% 1/4 W	348938	80031	CR251-4-5P150KTS	1		
R15	RES, DEP CAR, 1.5 +/- 5% 1/4 W	343418	80031	CR251-4-5P1K5TS	2		
R16	RES, DEP CAR, 1.5 +/- 5%, 1/4W	343418	80031	CR251-4-5P1K5TS	REF		
R17	RES, DEP CAR, 22K +/-5%, 1/4W	348870	80031	CR251-4-5P22KTS	REF		
R19	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R20	RES, VAR, CERMET, 10K +/-10%, 1/2W	309674	89536	309674	1		
R21	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R22	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	4		
R23	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R24	RES, DEP CAR, 1.2K +/- 5%, 1/4 W	441378	80031	CR251-4-5P1K2TS	1		
R25	RES, DEP CAR, 270 +/- 5%, 1/4 W	348789	80031	CR251-4-5P270ETS	1		
R26	RES, DEP CAR, 220 +/- 5% 1/4 W	342626	80031	CR251-4-5P220ETS	1		
R27	RES, DEP CAR, 33 +/- 5% 1/4 W	414524	80031	CR251-4-5P33ETS	1		
R28	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R29	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R30	RES, DEP CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-4-5P2K7TS	REF		
R31	RES, DEP CAR, 150 +- 5%, 1/4W	343442	80031	CR251-4-5P150ETS	REF		
R32	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R33	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R34	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R35	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R36	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	REF		
R37	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	REF		
R38	RES, DEP CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	REF		
R39	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R40	RES, DEP CAR, 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	REF		
R41	RES, DEP CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R42	RES, DEP CAR, 27 +/- 5% 1/4 W	348763	80031	CR251-4-5P27ETS	2		
R43	RES, DEP CAR, 27 +/- 5% 1/4 W	348763	80031	CR251-4-5P27ETS	REF		
R44	RES, DEP CAR, 4.7K +/- 5%, 1/4 W	348821	80031	CR251-4-5P4K7TS	REF		
R45	RES, DEP CAR, 4.7K +/- 5%, 1/4 W	348821	80031	CR251-4-5P4K7TS	REF		
R46	RES, DEP CAR, 560 +/-5%, 1/4W	385948	80031	CR251-4-5P560ETS	REF		
R48	RES, DEP CAR, 180 +/-5%, 1/4W	441436	80031	CR251-4-5P180ETS	REF		

Table 601-2. A2 Main PCB Assembly (Battery) (Concluded)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R49	RES. DEP CAR. 10K +/-5%. 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R50	RES. DEP CAR. 10K +/-5%. 1/4W	348839	80031	CR251-4-55P10KTS	REF		
R51	RES. DEP CAR. 100K +/- 5% 1/4 W	348920	80031	CR251-4-5P100KTS	REF		
R52	RES. DEP CAR. 10K +/- 5%. 1/4 W	348839	80031	CR251-4-55P10KTS	REF		
S1 - S13	SWITCH ASSY	429589	89536	429589	1		
S1	SW. BUTTON. GREEN	445197	89536	445197	1		
S2	SW. BUTTON. BLUE	445205	89536	445205	1		
S3	SW. BUTTON. DARK GREY	426759	89536	426759	6		
S4	SW. BUTTON. DARK GREY	426759	89536	426759	REF		
S5	SW. BUTTON. DARK GREY	426759	89536	426759	REF		
S6	SW. BUTTON. DARK GREY	426759	89536	426759	REF		
S7	SW. BUTTON. DARK GREY	426759	89536	426759	REF		
S8	SW. BUTTON. LIGHT GREY	425900	89536	425900	5		
S9	SW. BUTTON. LIGHT GREY	425900	89536	425900	REF		
S10	SW. BUTTON. LIGHT GREY	425900	89536	425900	REF		
S11	SW. BUTTON. LIGHT GREY	425900	89536	425900	REF		
S12	SW. BUTTON. LIGHT GREY	425900	89536	425900	REF		
S13	SW. BUTTON. DARK GREY	426759	89536	426759	REF		
S14	SWITCH SLIDE	354878	95146	MSS22504	1		
T1	PWR. XFMR. BATTERY OPTION	463802	89536	463802	1		
U1	IC. CKT. ANALOG BIP. DC WIDEBAND AMP.	429191	89536	429191	1	1	
U2	IC. ECL EDGE-TRIG FLIP-FLOP	402743	12040	F95029DC	1	1	
U3	IC.TTL.DUAL.JK EDGE-TRIG FLIP-FLOP	363440	01295	SN74S112N	2	1	
U4	IC.TTL.DUAL.JK EDGE-TRIG FLIP-FLOP	363440	01295	SN74S112N	REF		
U5	IC. QUAD 2-INPUT. POS NOR GATES	288845	01295	SN7402N	1	1	
U6	SEE FINAL ASSY. PTS LIST						
U7	SEE FINAL ASSEMBLY PARTS LIST						
U8	IC. TTL. 50 MHZ DECADE COUNTER	320754	01295	SN74196N	1	1	
U9	IC. TTL. MSI DECADE COUNTERS	402545	01295	SN74LS90N	1	1	
U10	IC. MOS-TO-LED. HEX/DIGIT/DRIVER	429506	12040	DS75492N	1	1	
U15	IC. LINEAR. TIMER	402610	12040	LM555CN	1	1	
W1	CABLE ASSY. W/ BNC CONNECTOR	468983	89536	468983	1		
XF1	FUSE HOLDER. BAYONET CAP	460329	89536	460329	1		
XF1-1	FUSE INSERT	460238	89536	460238	1		
XF1-2	INSERT. FUSE-BLACK (230 V)	461020	89536	031-11663	1		
XU1	SOCKET. IC. 18 PIN	413229	91506	318-AGC39D	1		
XU2	SOCKET. IC. 16 PIN	276535	91506	316-AGC39D	1		
XU6	SOCKET. IC 40 PIN	386060	09922	DILB40P-1	2		
XU7	SOCKET. IC 40 PIN	386060	09922	DILB40P-1	REF		
Y1	CRYSTAL 10 MHZ	385732	89536	385732	1		

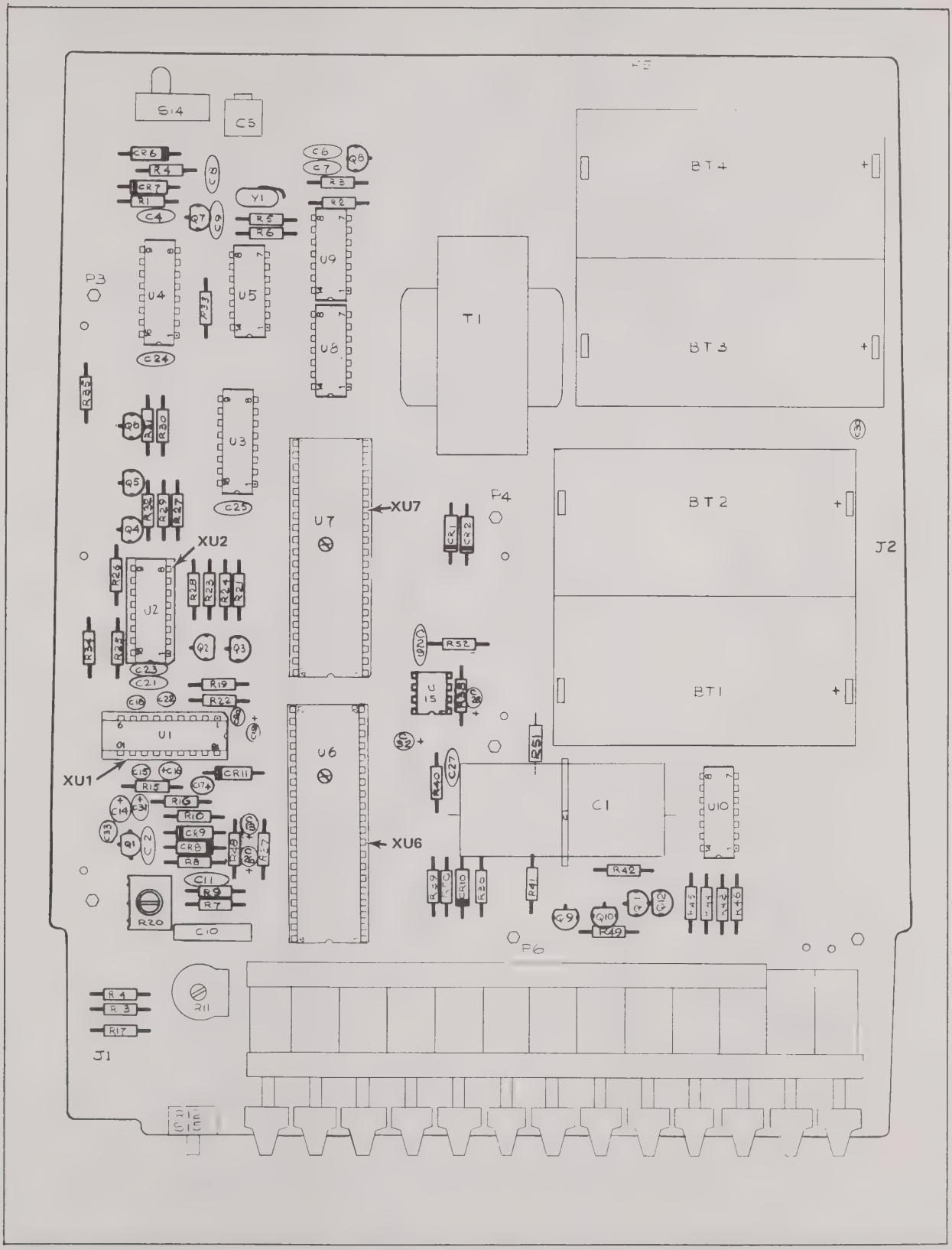

Figure 601-2. A2 Main PCB Assembly (Battery) (Sheet 1 of 3)

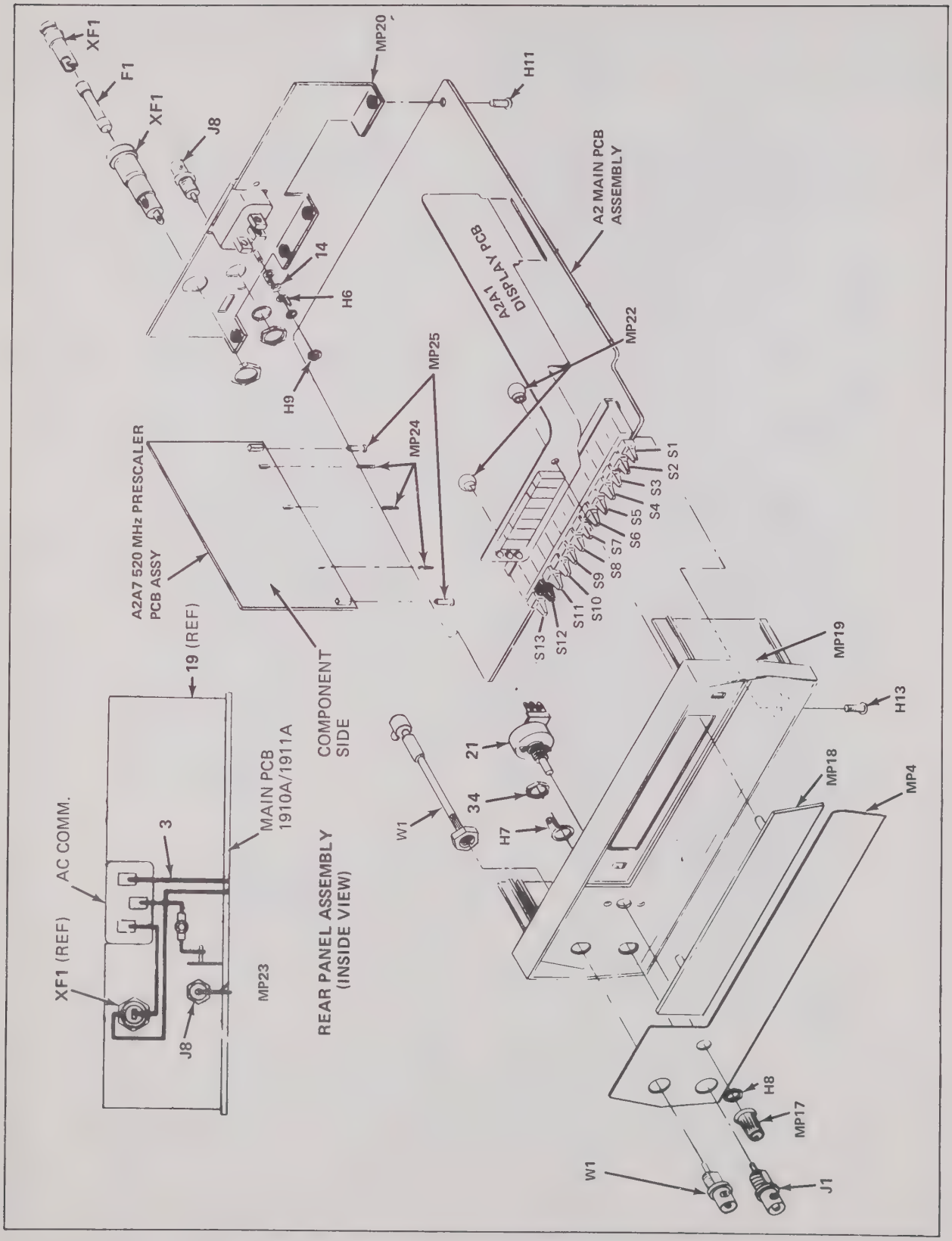

Figure 601-2. A2 Main PCB Assembly (Battery) (Sheet 2 of 3)

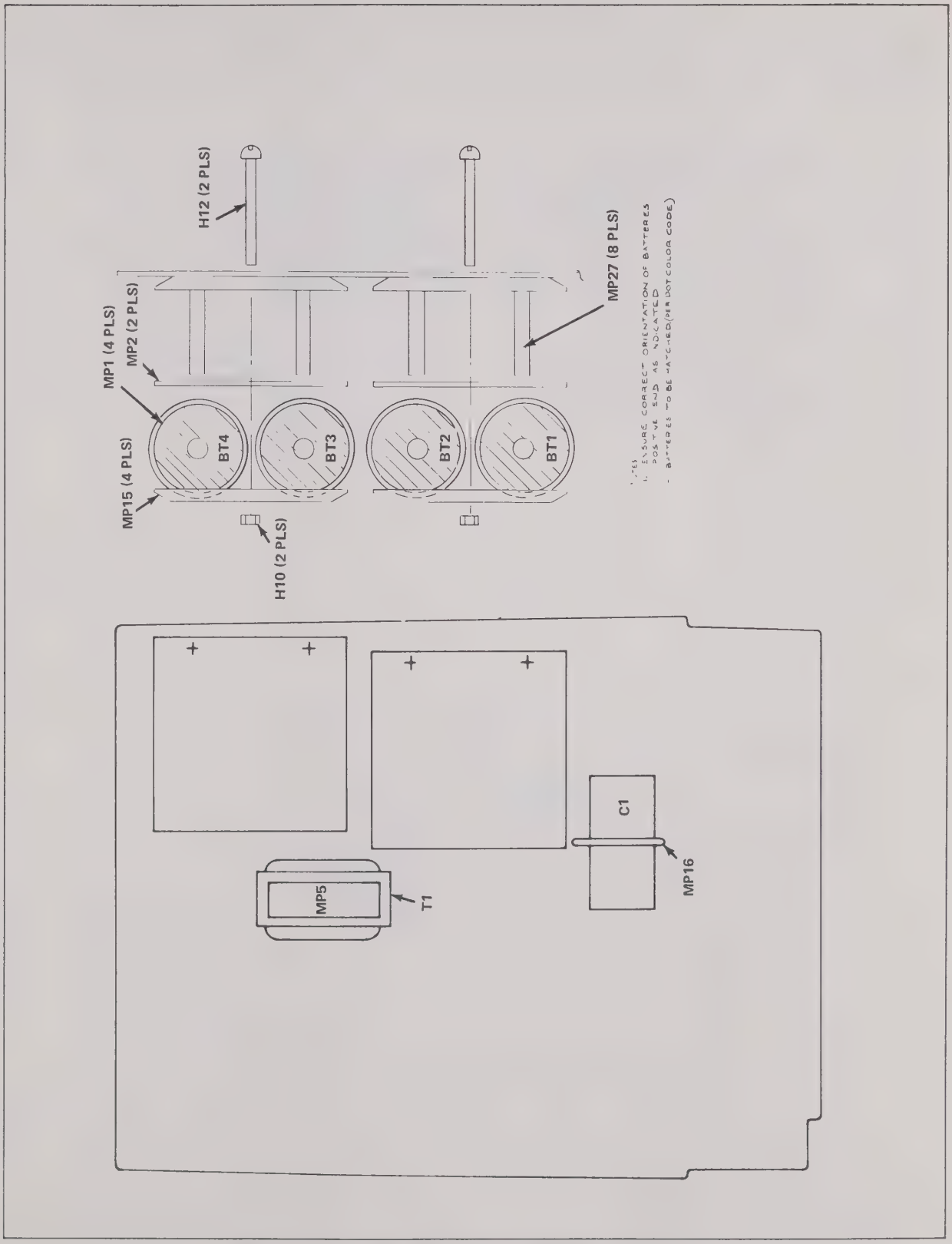

Figure 601-2. A2 Main PCB Assembly (Battery) (Sheet 3 of 3)

Table 601-3. A3 Inverter PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A3	INVERTER PCB ASSY,FIGURE 601-3	443333	89536	443333	REF		
C401	CAP, TA 10UF +/-20%, 15V	193623	56289	196D105K0015KA1	3		
C402	CAP, TA 10UF +/-20%, 15V	193623	56289	196D105K0015KA1	REF		
C403	CAP, CER, 0.1 UF +/-GMV, 20V MIN.	369199	71590	UK-10-104	1		
C404	CAP, CER, 47 PF +/-20%, 1000V	369132	56289	C030B102-H470J	1		
C405	CAP, TA 10UF +/-20%, 15V	193623	56289	196D105K0015KA1	REF		
CR401	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	2	1	
CR402	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	REF		
J4	CONNECTOR RCPTCL, FEMALE, SMALL	375329	00779	85863-3	2		
J7	RECEPTACLE, LARGE	149112	74970	105-0753	2		
L401	CHOKE, 6-TURN	320911	89536	320911	1		
Q401	XSTR, SI, NPN	218396	04713	2N3904	2	1	
Q402	XSTR, SI, NPN	218396	04713	2N3904	REF		
R401	RES, DEP CAR, 220 +/-5%, 1/4W	342626	80031	CA251-4-5P220ETS	1		
R402	RES, DEP CAR, 82, +/-5%, 1/4W	442277	80031	CR251-4-5P82ETS	1		
R403	RES, DEP CAR, 22, +/-5%, 1/4W	381145	80031	CR251-4-5P22ETS	1		
T401	XFMR, INVERTER	462093	89536	462093	1		
U401	IC, LINEAR, NEG VOLT, REG 3-TURN	429514	07263	79M12HC	1	1	
XU401	TRANSIPAD, IC	152207	07047	10123-DAP	1		

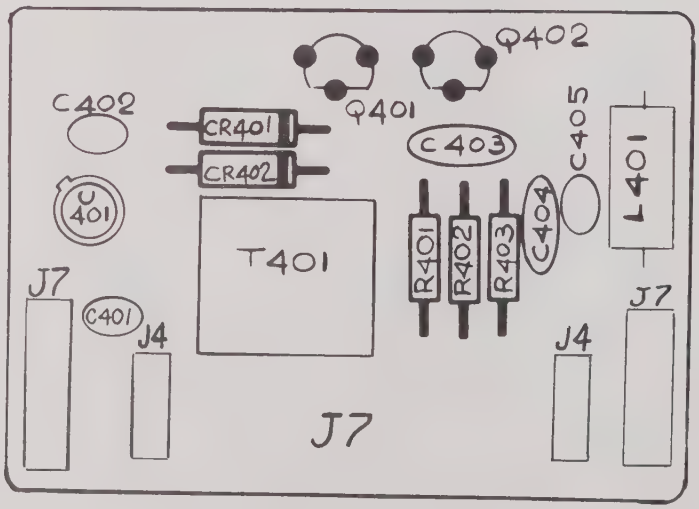

Figure 601-3. A3 Inverter PCB Assembly

Table 601-4. A4 AC PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A4	AC PCB ASSY, FIGURE 601-4	ORDER	FOR	REQUIRED SOURCE			
	115V OPTION, 58-62 HZ (1910A-4006T)	456251	89536	456251	REF		
	230V OPTION, 48-52 HZ (1910A-4013T)	459362	89536	459362	REF		
	100V OPTION, 48-52 HZ (1910A-4012T)	459370	89536	459370	REF		
	100V OPTION, 58-62 HZ (1910A-4014T)	463307	89536	463307	REF		
C601	CAP, MYLAR,6UF +/-5%,115V (LL5V 58-62HZ)	393546	98536	393546/D2-505D	2		
C601-1	CAP,PLPRLN,3.3UF+/-5%,300V(230V,48-52HZ)	380253	89536	380253	1		
C601-2	CAP,MYLAR,6.6UF+/-5%,135V(100V,58-62HZ)	394189	89536	394189	1		
CR601	DIODE, ZENER, UNCOMP, 30V	453134	12969	UZ8730	2	1	
CR602	DIODE, ZENER, UNCOMP, 30V	453134	12969	UZ8730	REF		
J6	CONNECTOR, SMALL	375329	00779	85863-3	2		
J6	CONNECTOR, LARGE	149112	74970	105-0753	2		
MP1	HOLDER, COMPONENT, RUBBER	104794	98159	2829-115-3	1		
MP2	DECAL, WARNING	386250	89536	386250	1		
R601	RES, DEP CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1MTS	1		

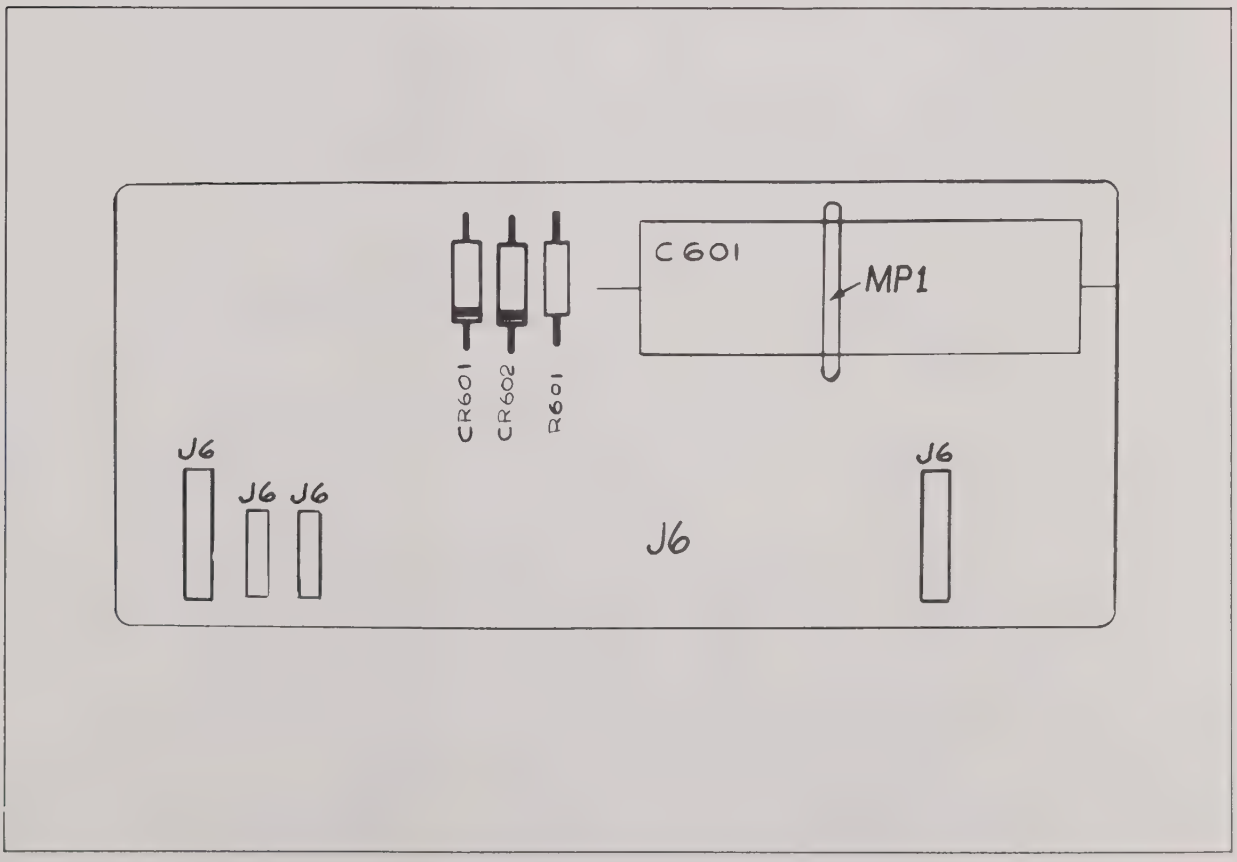

Figure 601-4. A4 AC PCB Assembly

Option —02
Data Output Unit

602-1. INTRODUCTION

602-2. The DOU consists of 18 data lines containing all the display data necessary for external logging. The data lines are output on an extender PCB at the rear of the instrument. Due to space limitation, this option may only be used on line versions of the Model 1912A.

602-3. OPERATION

602-4. The output data available at the rear panel DOU connector is listed in Table 602-1. The encoded input data to position the decimal in the frequency and period modes are given in Tables 602-2 and 602-3 respectively. To interface the DOU with an external logging unit see theory of operation of this section.

602-5. THEORY OF OPERATION

602-6. The DOU's output on connector J5 is obtained directly from the latches contained in U7. Its timing sequence is therefore exactly the same as the display strobe cycle (see Figure 602-1). Because the displays are strobed serially, the output data on the DOU is also serial, and any external logging system interfaced with the DOU must be capable of using serial data or it must have its own serial to parallel converter.

602-7. The decimal point positioning and unit annunciators are enabled simultaneously with the selection of a range (see Table 602-2 for frequency mode encoding, which will apply a encoded input to U6 on Pins 22, 23, and 24, and Table 602-3 for period mode encoding).

Table 602-1. DOU Output Data

PIN NO. (J5)	NOMENCLATURE	FUNCTION
1 & 3		Ground
2 & 4	Not used	
5	B1 (Blanking)	Blanks leading Zero
6	D, (8)	BCD Information
7	C, (4)	BCD Information
8	B, (2)	BCD Information
9	A, (1)	BCD Information
10	Dsl, (digit - 1 strobe)	Enable 1st digit LED (LSD, - strobed last)
11	DS2, (digit - 2 strobe	Enable 2nd LED, (2SD)
12	DS3, (digit - 3 strobe)	Enable 3rd LED (3SD)
13	DS4, (digit - 4 strobe)	Enable 4th LED, (4SD)
14	DS5, (digit - 5 strobe)	Enable 5th LED, (5SD)
15	DS6, (digit - 6 strobe)	Enable 6th LED (6SD)
16	Ovfl, (overflow)	Enable overflow annunciator (goes high following MUP if carry out of MSD
17	DP, (decimal position)	Occurs simultaneously with digit strobe.
18	UX, (Units enable)	Enable units annunciator simultaneously with digit strobe lines.
19	DS7, (digit - 7 strobe)	Enable 7th LED, (MSD, strobed first)
20	MUP, memory update	Indicates new data being entered.

Table 602-2. Decimal Positioning (Frequency Mode)

ENCODED INPUT TO U6 (FREQUENCY MODE)			GATE TIME	DECIMAL LOCATION (DISPLAY LED)	ANNUNCIATOR
R22	R23	R24			
0	1	0	10 msec	D4	MHz
1	1	0	0.1 sec	D2	kHz
0	0	1	1.0 sec	D3	kHz
1	0	1	10 sec	D4	kHz
1	1	1	Autorange	*	*

**In autorange the gate time varies between 0.1 and 1 sec. Decimal and units corresponds to gate time as listed above.*

Table 602-3. Decimal Positioning (Period Mode)

ENCODED INPUT TO U6 (PERIOD MODE)			CYCLES	DECIMAL LOCATION (DISPLAY LED)	ANNUNCIATOR
R22	R23	R24			
0	0	0	10^0	D5	msec
1	0	0	10^1	D6	msec
0	1	0	10^2	D4	usec
1	1	0	10^3	D5	usec
1	1	1	Autorange	*	*

**Autoranges through all four of the above ranges plus 10^4 periods averaged, which is D6 and usec's.*

NOTE

The drive capability of all data outputs in PMOS; must be able to sink 0.16 mA at logic 0 or source 0.16 mA for logic 1 levels.

602-8. The timing diagram of Figure 602-1 is for one test case in which an input signal of 3.8 MHz is applied to channel A, frequency mode, with 100 Hz resolution.

NOTE

The DOU data is output on connector J5 in bcd format serially.

602-9. DOU INTERFACE CABLE

602-10. A mating DOU connector is supplied as part of the —02 option for use in fabricating a custom interface cable. Use the following procedure to fabricate the interface cable:

1. Assemble the following equipment:
   a. Teflon or vinyl insulated wire, 26 gauge, 20 pieces cut to desired length.
   b. Sleeving, # 16 for vinyl insulated wire, or # 18 for teflon insulated wire.
   c. Rosin core solder, 60/40
   d. Wire strippers
   e. Soldering Iron, pencil-type (45W max.)
   f. DOU mating connector
   g. Mating connector for interfaced instrument.
   h. Connector vice
2. Slide cable wires through the DOU connector backshell (hood) as shown in Figure 602-2.
3. Strip one-eighth of an inch of insulation from the DOU connector end of the cable. Tin the ends.
4. Cut 20 pieces of sleeving to a length of three-sixteenths of an inch.
5. Slide one piece of sleeving over each prepared wire end.

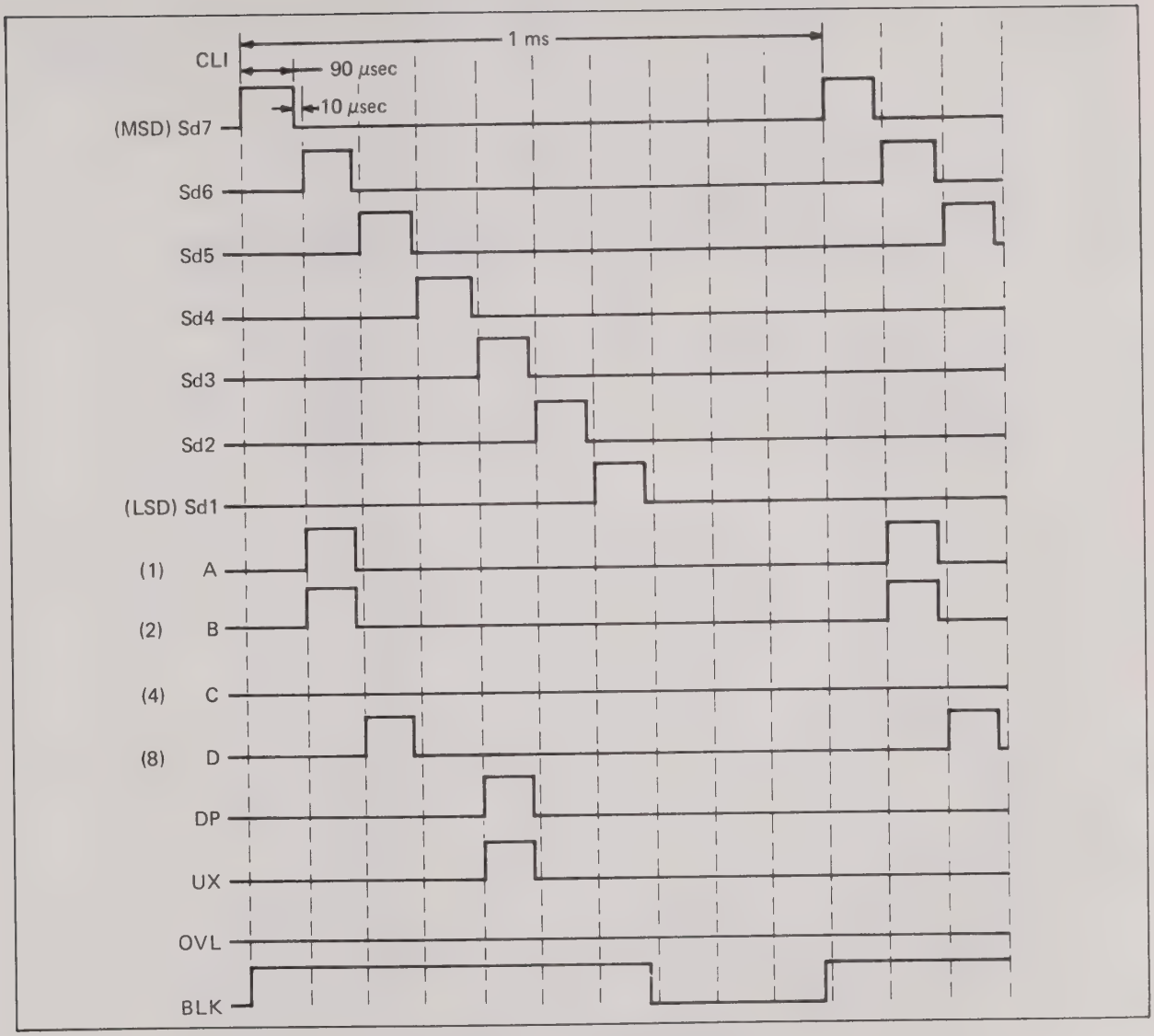

Figure 602-1. DOU Timing Diagram

6. Place the DOU mating connector in the connector vice, and tin each connector pin.

7. Solder one prepared wire to each connector pin.

8. Position the sleeving over the solder joints, and install the connector backshell (hood) and strain relief as shown in Figure 602-2.

9. Install the wires on the mating connector for the interfaced instrument using the DOU connector information given in Table 602-1.

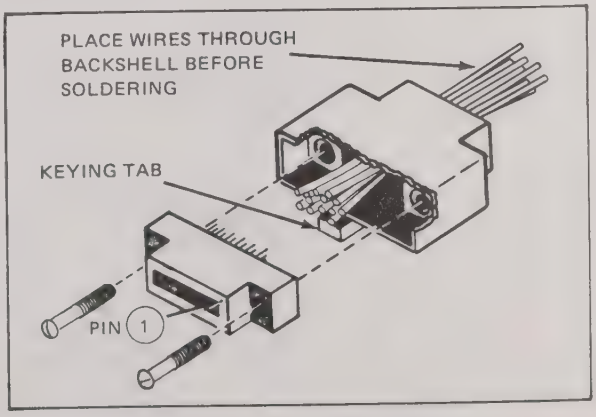

Figure 602-2. DOU Connector

Table 602-4. Option —02 DOU

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
-02	DOU, FIGURE 602-3 (SHT 1 OF 2)	ORDER	1921A	-02			
A12	DOU PCB ASSY	ORDER	NEXT	HIGHER LEVEL	1		
H6	SCREW, PHP, 4-40 X 1/4	129890	73734	19022	2		
H7	SCREW, PHP, 6-32 X 1/4 (NOT SHOWN)	152140	73734	19042	2		
MP1	CABLE TIE, 4 INCH (NOT SHOWN)	172080	06383	SST-1M	1		
MP2	CASE, DOU	458323	89536	458323	1		
MP3	CONN, RECEPTACLE, CARD-EDGE (NOT SHOWN)	352310	89536	352310	1		
MP4	CONNECTOR, BACKSHELL (NOT SHOWN)	357020	89536	357020	1		
A12	DOU PCB ASSY, FIGURE 602-3 (SHT 2 OF 2)	ORDER	NEXT	HIGHER LEVEL	REF		
H4	NUT, HEX, 4-40	110635	73734	8003NP	1		
H5	SCREW, PHP, 4-40 X 5/16	152116	73734	19023	1		
H6	WASHER, FLAT #4	195909	73734	97405	1		
H7	WASHER, INT LOCK #4	110403	73734	99402	1		
H8	TERMINAL, CONN POST	376574	00779	3-87022-1	18		
MP1	CABLE CLAMP, 3/16	101345	95987	3/16-3NA	AR		
MP2	COVER CONNECTOR	450015	89536	450015	1		

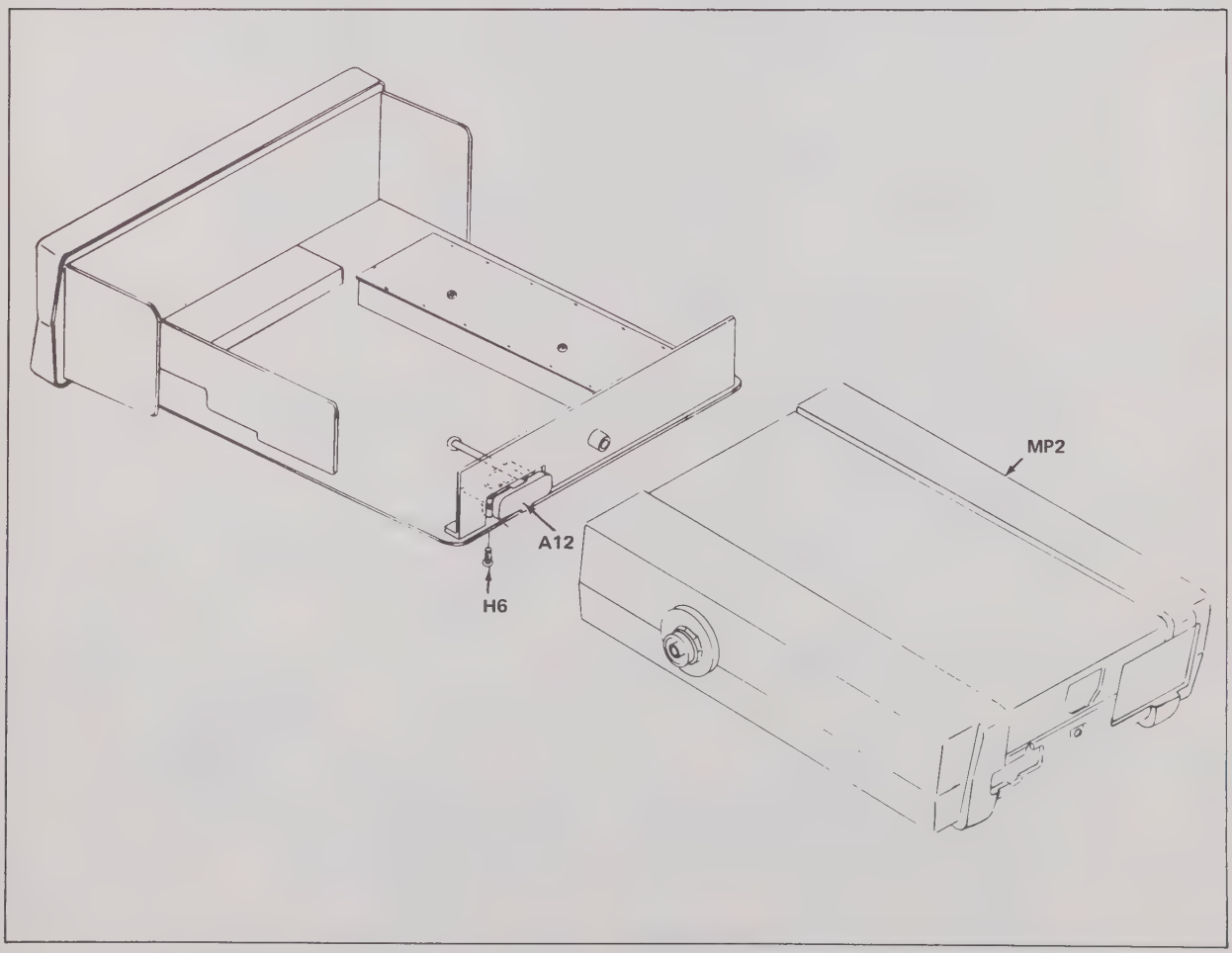

Figure 602-3. Option —02 DOU (Sheet 1 of 2)

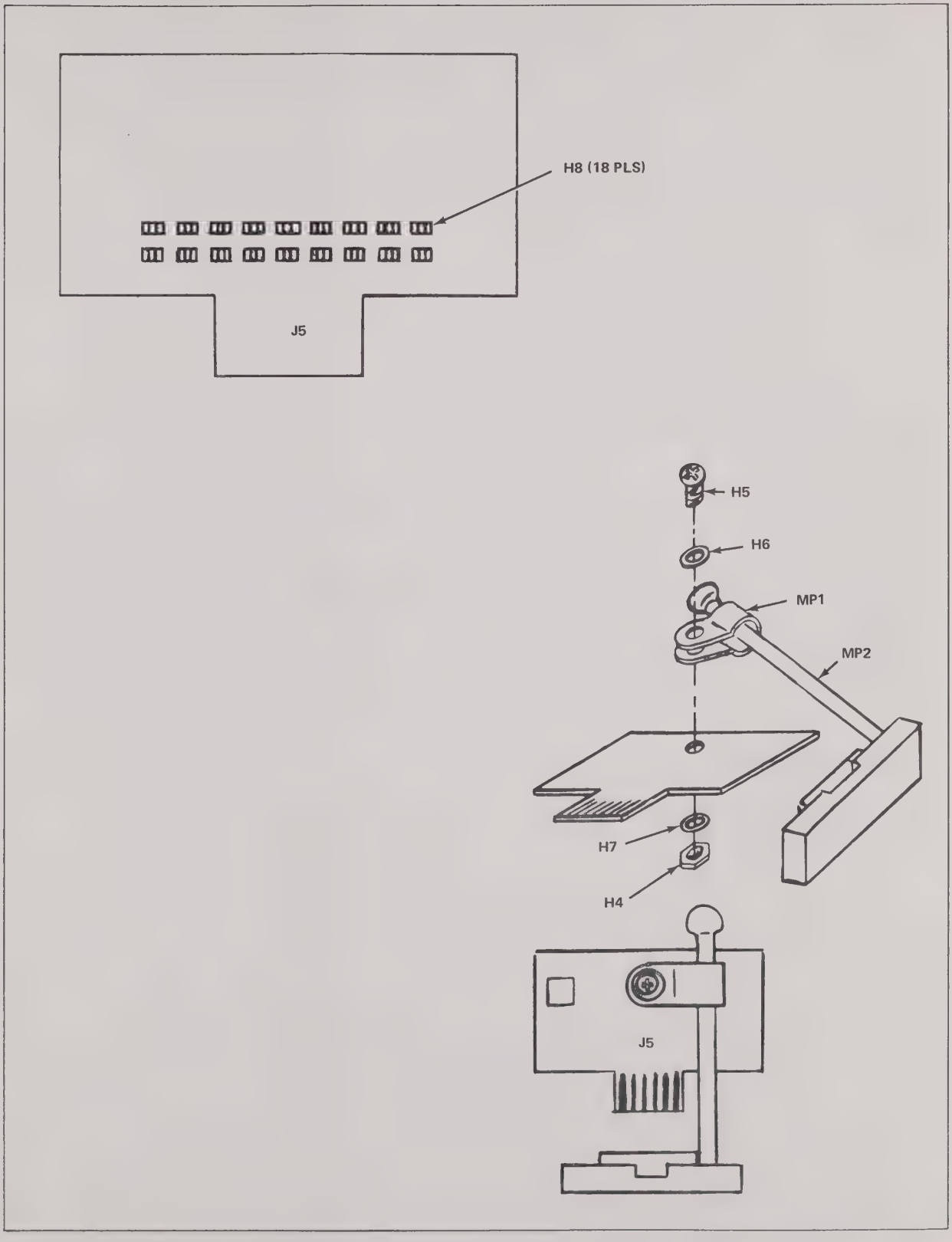

Figure 602-3. Option —02 DOU (Sheet 2 of 2)

Option —03
TCXO

603-1. OPTION —03 TCXO

603-2. INTRODUCTION

603-3. Option —03 is a temperature compensated crystal oscillator (TCXO) which exhibits superior stability than the standard Y1 by using a neutralization circuit. The effects of the neutralization circuit on the crystals center frequency is shown in Figure 603-1. The resultant center frequency deviation (solid line) is held to a minimum over the designed temperature range. Within the desired temperature range the —03 affords a very stable output frequency as well as instantaneous warmup and low power consumption. However, if the temperature limits are exceeded, the crystal's stability will no longer be valid (See Section 1).

603-4. CALIBRATION

1. Allow the counter to operate for at least 30 minutes to stabilize the internal temperature.

2. Select the channel A frequency function, at 0.1 Hz resolution.

3. Connect the 10 MHz reference frequency to the channel A input.

4. Using a non-conductive screwdriver, adjust the TCXO through the rear panel. See component and test point location drawing in Section 4, to obtain a reading of overflow 000.000 ± 10 digits.

603-5. LIST OF REPLACEABLE PARTS

603-6. The —03 TCXO is a completely sealed unit, containing no replaceable parts (See Figure 603-2).

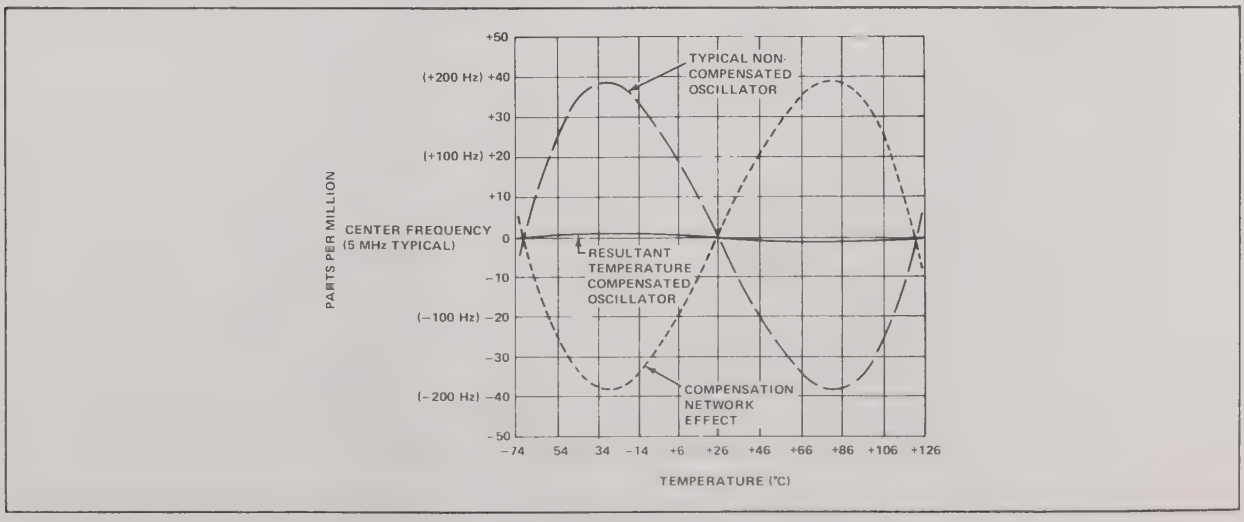

Figure 603-1. Temperature/Frequency Deviation

Table 603-1. —03/—04 TCXO, Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
-03	TCXO, FIGURE 603-2, -03	ORDER	MODEL	1912A-03			
-04	TCXO, FIGURE 603-2, -04	ORDER	MODEL	1912A-04			

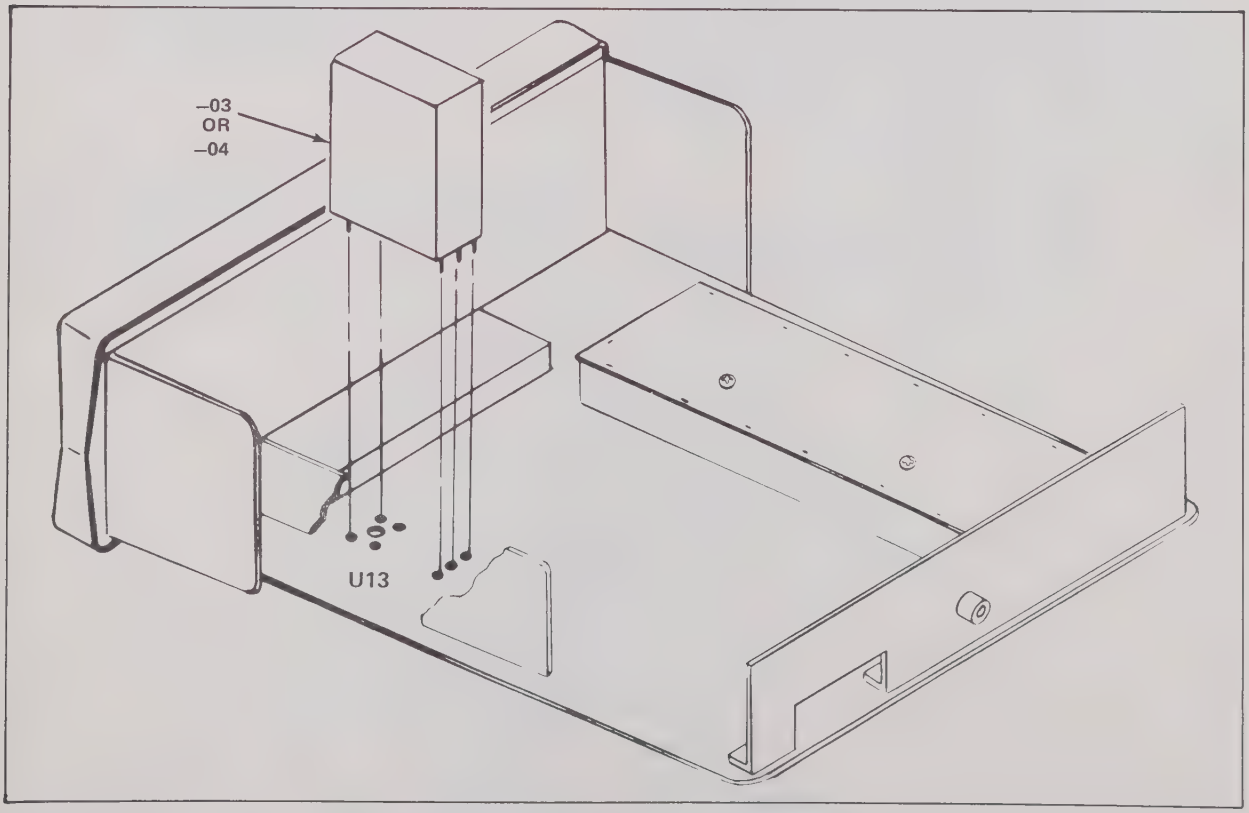

Figure 603-2. —03/—04 TCXO, Assembly

Option —04
TCXO (Superior)

604-1. OPTION —04 TCXO (SUPERIOR)

604-2. INTRODUCTION

604-3. Option —04 is also a temperature compensated crystal oscillator which used the same neutralization scheme as the —03 Option (See Figure 603-1). However, because of tighter specifications, it is able to reduce its total deviation from the standard 10 MHz to approximately ¼ of the —03's deviation, 0.5 ppm/month.

604-4. CALIBRATION

1. Alow the counter to operate for at least 3 hours to stabilize internal temperature.
2. Select the channel A frequency function at 0.1 Hz resolution.
3. Connect the 10 MHz reference frequency to the channel A input.
4. Using a non-conductive screwdriver adjust the TCXO through the rear panel, see component and test point location drawing in Section 4, to obtain a reading of 000.0000 ± 3 digits.

604-5. LIST OF REPLACEABLE PARTS

604-6. The —04 TCXO is a completely sealed unit, containing no replaceable parts (See Figure 603-2).

Section 7

General Information

7-1. This section of the manual contains generalized user information as well as supplemental information to the List of Replaceable parts contained in Section 5. The following information is presented in this section:

List of Abbreviations

Federal Supply Codes for Manufacturers

Fluke Technical Service Centers — U.S. and Canada

Sales and Service Locations — International

Sales Representatives — U.S. and Canada

Table 7-1. LIST OF ABBREVIATIONS AND SYMBOLS

A or amp	ampere
ac	alternating current
af	audio frequency
a/d	analog-to-digital
assy	assembly
AWG	american wire gauge
B	bel
bcd	binary coded decimal
^{o}C	Celsius
cap	capacitor
ccw	counterclockwise
cer	ceramic
cermet	ceramic to metal(seal)
ckt	circuit
cm	centimeter
cmrr	common mode rejection ratio
comp	composition
cont	continue
crt	cathode-ray tube
cw	clockwise
d/a	digital-to-analog
dac	digital-to-analog converter
dB	decibel
dc	direct current
dmm	digital multimeter
dvm	digital voltmeter
elect	electrolytic
ext	external
F	farad
^{o}F	Fahrenheit
FET	Field-effect transistor
ff	flip-flop
freq	frequency
FSN	federal stock number
g	gram
G	giga (10^{9})
gd	guard
Ge	germanium
GHz	gigahertz
gmv	guaranteed minimum value
gnd	ground
H	henry
hd	heavy duty
hf	high frequency
Hz	hertz
IC	integrated circuit
if	intermediate frequency
in	inch(es)
intl	internal
I/O	input/output
k	kilo (10^{3})
kHz	kilohertz
kΩ	kilohm(s)
kV	kilovolt(s)
lf	low frequency
LED	light-emitting diode
LSB	least significant bit
LSD	least significant digit
M	mega (10^{6})
m	milli (10^{-3})
mA	milliampere(s)
max	maximum
mf	metal film
MHz	megahertz
min	minimum
mm	millimeter
ms	millisecond
MSB	most significant bit
MSD	most significant digit
MTBF	mean time between failures
MTTR	mean time to repair
mV	millivolt(s)
mv	multivibrator
MΩ	megohm(s)
n	nano (10^{-9})
na	not applicable
NC	normally closed
(–) or neg	negative
NO	normally open
ns	nanosecond
opnl ampl	operational amplifier
p	pico (10^{-12})
para	paragraph
pcb	printed circuit board
pF	picofarad
pn	part number
(+) or pos	positive
pot	potentiometer
p-p	peak-to-peak
ppm	parts per million
PROM	programmable read-only memory
psi	pound-force per square inch
RAM	random-access memory
rf	radio frequency
rms	root mean square
ROM	read-only memory
s or sec	second (time)
scope	oscilloscope
SH	shield
Si	silicon
serno	serial number
sr	shift register
Ta	tantalum
tb	terminal board
tc	temperature coefficient or temperature compensating
tcxo	temperature compensated crystal oscillator
tp	test point
u or μ	micro (10^{-6})
uhf	ultra high frequency
us or μs	microsecond(s) (10^{-6})
uut	unit under test
V	volt
v	voltage
var	variable
vco	voltage controlled oscillator
vhf	very high frequency
vlf	very low frequency
W	watt(s)
ww	wire wound
xfmr	transformer
xstr	transistor
xtal	crystal
xtlo	crystal oscillator
Ω	ohm(s)
μ	micro (10^{-6})

Federal Supply Codes for Manufacturers (Continued)

00213
Nytronics Comp. Group Inc.
Subsidiary of Nytronics Inc.
Formerly Sage Electronics
Rochester, New York

00327
Welwyn International, Inc.
Westlake, Ohio

00656
Aerovox Corp.
New Bedford, Massachusetts

00686
Film Capacitors, Inc.
Passaic, New Jersey

00779
AMP Inc.
Harrisberg, Pennsylvania

01121
Allen-Bradley Co.
Milwaukee, Wisconsin

01281
TRW Electronic Comp.
Semiconductor Operations
Lawndale, California

01295
Texas Instruments, Inc.
Semiconductor Group
Dallas, Texas

01537
Motorola Communications &
Electronics Inc.
Franklin Park, Illinois

01686
RCL Electronics Inc.
Manchester, New Hampshire

01730
Replaced by 73586

01884 - use 56289
Sprague Electric Co.
Dearborn Electronic Div.
Lockwood, Florida

02114
Ferroxcube Corp.
Saugerties, New York

02131
General Instrument Corp.
Harris ASW Div.
Westwood, Maine

02395
Rason Mfg. Co.
Brooklyn, New York

02533
Snelgrove, C.R. Co., Ltd.
Don Mills, Ontario, Canada
M3B 1M2

02606
Fenwal Labs
Div. of Travenal Labs.
Morton Grove, Illinois

02660
Bunker Ramo Corp., Conn Div.
Formerly Amphenol-Borg
Electric Corp.
Broadview, Illinois

02799
Areo Capacitors, Inc.
Chatsworth, California

03508
General Electric Co.
Semiconductor Products
Syracuse, New York

03614
Replaced by 71400

03651
Replaced by 44655

03797
Eldema Div.
Genisco Technology Corp.
Compton, California

03877
Transistron Electronic Corp.
Wakefield, Massachusetts

03888
KDI Pyrofilm Corp.
Whippany, New Jersey

03911
Clairex Electronics Div.
Clairex Corp.
Mt. Vernon, New York

03980
Muirhead Inc.
Mountainside, New Jersey

04009
Arrow Hart Inc.
Hartford, Connecticut

04062
Replaced by 72136

04202
Replaced by 81312

04217
Essex International Inc.
Wire & Cable Div.
Anaheim, California

04221
Aemco, Div. of
Midtex Inc.
Mankato, Minnesota

04222
AVX Ceramics Div.
AVX Corp.
Myrtle Beach, Florida

04423
Telonic Industries
Laguna Beach, California

04645
Replaced by 75376

04713
Motorola Inc. Semiconductor
Products
Phoenix, Arizona

04946
Standard Wire & Cable
Los Angeles, California

05082
Replaced by 94988

05236
Jonathan Mfg. Co.
Fullerton, California

05245
Components Corp. now
Corcom, Inc.
Chicago, Illinois

05277
Westinghouse Electric Corp.
Semiconductor Div.
Youngwood, Pennsylvania

05278
Replaced by 43543

05279
Southwest Machine &
Plastic Co.
Glendora, California

05397
Union Carbide Corp.
Materials Systems Div.
New York, New York

05571 - use 56289
Sprague Electric Co.
Pacific Div.
Los Angeles, California

05574
Viking Industries
Chatsworth, California

05704
Replaced by 16258

05820
Wakefield Engineering Inc.
Wakefield, Massachusetts

06001
General Electric Co.
Electronic Capacitor &
Battery Products Dept.
Columbia, South Carolina

06136
Replaced by 63743

06383
Panduit Corp.
Tinley Park, Illinois

06473
Bunker Ramo Corp.
Amphenol SAMS Div.
Chatsworth, California

06555
Beede Electrical Instrument Co.
Penacook, New Hampshire

06739
Electron Corp.
Littleton, Colorado

06743
Clevite Corp.
Cleveland, Ohio

06751
Components, Inc. Semcor Div.
Phoenix, Arizona

06860
Gould Automotive Div.
City of Industry, California

06961
Vernitron Corp., Piezo
Electric Div.
Formerly Clevite Corp., Piezo
Electric Div.
Bedford, Ohio

06980
Eimac Div.
Varian Associates
San Carlos, California

07047
Ross Milton, Co., The
South Hampton, Pennsylvania

07115
Replaced by 14674

07138
Westinghouse Electric Corp.,
Electronic Tube Division
Horsehead, New York

07233
TRW Electronic Components
Cinch Graphic
City of Industry, California

07256
Silicon Transistor Corp.
Div. of BBF Group Inc.
Chelmsford, MA

07261
Aumet Corp.
Culver City, California

07263
Fairchild Semiconductor
Div. of Fairchild Camera
& Instrument Corp.
Mountain View, California

07344
Bircher Co., Inc.
Rochester, New York

07597
Burndy Corp.
Tape/Cable Div.
Rochester, New York

07792
Lerma Engineering Corp.
Northampton, Massachusetts

07910
Teledyne Semiconductor
Formerly Continental Device
Hawthorne, California

07933 - use 49956
Raytheon Co.
Semiconductor Div. HQ
Mountain View, California

08225
Industro Transistor Corp.
Long Island City, New York

08261
Spectra Strip Corp.
Garden Grove, California

08530
Reliance Mica Corp.
Brooklyn, New York

08806
General Electric Co.
Miniature Lamp Products Dept.
Cleveland, Ohio

08863
Nylomatic Corp.
Norrisville, Pennsylvania

08988 - use 53085
Skottie Electronics Inc.
Archbald, Pennsylvania

09214
G.E. Co. Semi-Conductor
Products Dept.
Power Semi-Conductor
Products OPN Sec.
Auburn, New York

09353
C and K Components
Watertown, Massachusetts

09423
Scientific Components, Inc.
Santa Barbara, California

09922
Burndy Corp.
Norwalk, Connecticut

09969
Dale Electronics Inc.
Yankton, S. Dakota

10059
Barker Engineering Corp.
Formerly Amerace, Amerace
ESNA Corp.
Kenilworth, New Jersey

11236
CTS of Berne
Berne, Indiana

11237
CTS Keene Inc.
Paso Robles, California

11358
CBS Electronic Div.
Columbia Broadcasting System
Newburyport, MN

11403
Best Products Co.
Chicago, Illinois

11503
Keystone Columbia Inc.
Warren, Michigan

11532
Teledyne Relays
Hawthorne, California

11711
General Instrument Corp
Rectifier Division
Hickville, New York

11726
Qualidyne Corp.
Santa Clara, California

12014
Chicago Rivet & Machine Co.
Bellwood, Illinois

12040
National Semiconductor Corp.
Danburry, Connecticut

12060
Diodes, Inc.
Chatsworth, California

12136
Philadelphia Handle Co.
Camden, New Jersey

12300
Potter-Brumfield Division
AMF Canada LTD.
Guelph, Onatrio, Canada

12323
Presin Co., Inc.
Shelton, Connecticut

12327
Freeway Corp. formerly
Freeway Washer & Stamping Co.
Cleveland, Ohio

12443
Budd Co. The, Polychem Products
Plastic Products Div.
Bridgeport, PA

12615
U.S. Terminals Inc.
Cincinnati, Ohio

12617
Hamlin Inc.
Lake Mills, Wisconsin

12697
Clarostat Mfg. Co.
Dover, New Hampshire

12749
James Electronics
Chicago, Illinois

12856
Micrometals
Sierra Madre, California

12954
Dickson Electronics Corp.
Scottsdale, Arizona

12969
Unitrode Corp.
Watertown, Massachusetts

13103
Thermalloy Co., Inc.
Dallas, Texas

13327
Solitron Devices Inc.
Tappan, New York

13511
Amphenol Cadre Div.
Bunker-Ramo Corp.
Los Gatos, California

13606 - use 56289
Sprague Electric Co.
Transistor Div.
Concord, New Hampshire

13839
Replaced by 23732

14099
Semtech Corp.
Newbury Park, California

14140
Edison Electronic Div.
Mc Gray-Edison Co.
Manchester, New Hampshire

14193
Cal-R-Inc. formerly
California Resistor, Corp.
Santa Monica, California

14298
American Components, Inc.
an Insilco Co.
Conshohocken, Pennsylvania

14655
Cornell-Dublier Electronics
Division of Federal Pacific
Electric Co. Govt. Control Dept.
Newark, New Jersey

14752
Electro Cube Inc.
San Gabriel, California

14869
Replaced by 96853

14936
General Instrument Corp.
Semi Conductor Products Group
Hicksville, New York

15636
Elec-Trol Inc.
Saugus, California

15801
Fenwal Electronics Inc.
Div. of Kidde Walter and Co., Inc.
Framingham, Massachusetts

15818
Teledyne Semiconductors, formerly
Amelco Semiconductor
Mountain View, California

15849
Litton Systems Inc. Useco Div.
formerly Useco Inc.
Van Nuys, California

15898
International Business
Machines Corp.
Essex Junction, Vermont

15909
Replaced by 14140

16258
Space-Lok Inc.
Burbank, California

16299
Corning Glass
Electronic Components Div.
Raleigh, North Carolina

16332
Replaced by 28478

16473
Cambridge Scientific Ind.
Div. of Chemed Corporation
Cambridge, Maryland

16742
Paramount Plastics Fabricators, Inc.
Downey, California

16758
Delco Electronics
Div. of General Motors Corp.
Kokomo, Indiana

17001
Replaced by 71468

17069
Circuit Structures Lab.
Burbank, California

17338
High Pressure Eng. Co., Inc.
Oklahoma City, Oklahoma

17545
Atlantic Semiconductors, Inc.
Asbury Park, New Jersey

17856
Siliconix, Inc.
Santa Clara, California

17870
Replaced by 14140

18178
Vactec Inc.
Maryland Heights, Missouri

18324
Signetics Corp.
Sunnyvale, California

18612
Vishay Resistor Products Div.
Vishay Intertechnology Inc.
Malvern, Pennsylvania

18736
Voltronics Corp.
Hanover, New Jersey

18927
G T E Sylvania Inc.
Precision Material Group
Parts Division
Titusville, Pennsylvania

19451
Perine Machinery & Supply Co.
Seattle, Washington

19701
Electro-Midland Corp.
Mepco-Electra Inc.
Mineral Wells, Texas

20584
Enochs Mfg. Inc.
Indianapolis, Indiana

20891
Self-Organizing Systems, Inc.
Dallas, Texas

21604
Buckeye Stamping Co.
Columbus, Ohio

21845
Solitron Devices Inc.
Transistor Division
Riveria Beach, Florida

22767
ITT Semiconductors
Palo Alto, California

23050
Product Comp. Corp.
Mount Vernon, New York

23732
Tracor Inc.
Rockville, Maryland

23880
Stanford Applied Engrng.
Santa Clara, California

23936
Pamotor Div., Wm. J. Purdy Co.
Burlingame, California

24248
Replaced by 94222

24355
Analog Devices Inc.
Norwood, Massachusetts

24655
General Radio
Concord, Massachusetts

24759
Lenox-Fugle Electronics Inc.
South Plainfield, New Jersey

25088
Siemen Corp.
Isilen, New Jersey

25403
Amperex Electronic Corp.
Semiconductor &
Micro-Circuits Div.
Slatersville, Rhode Island

27014
National Semiconductor Corp.
Santa Clara, California

27264
Molex Products
Downers Grove, Illinois

28213
Minnesota Mining & Mfg. Co.
Consumer Products Div.
St. Paul, Minnesota

28425
Serv-/-Link formerly
Bohannan Industries
Fort Worth, Texas

28478
Deltrol Controls Div.
Deltrol Corporation
Milwaukee, Wisconsin

28480
Hewlett Packard Co. Corporate H.Q.
Palo Alto, California

28520
Heyman Mfg. Co.
Kenilworth, New Jersey

29083
Monsanto, Co., Inc.
Santa Clara, California

29604
Stackpole Components Co.
Raleigh, North Carolina

30148
A B Enterprise Inc.
Ahoskie, North Carolina

30323
Illinois Tool Works, Inc.
Chicago, Illinois

31091
Optimax Inc.
Colmar, Pennsylvania

32539
Mura Corp.
Great Neck, New York

32767
Griffith Plastic Corp.
Burlingame, California

32879
Advanced Mechanical Components
Northridge, California

32897
Erie Technological Products, Inc.
Frequency Control Div.
Carlisle, Pennsylvania

32997
Bourns Inc.
Trimpot Products Division
Riverside, California

33173
General Electric Co.
Products Dept.
Owensboro, Kentucky

34333
Silicon General
Westminister, California

34335
Advanced Micro Devices
Sunnyvale, California

34802
Electromotive Inc.
Kenilworth, New Jersey

37942
Mallory, P.R. & Co., Inc.
Indianapolis, Indiana

42498
National Radio
Melrose, Massachusetts

43543
Nytronics Inc.
Transformer Co. Div.
Geneva, New York

44655
Ohmite Mfg. Co.
Skokie, Illinois

49671
RCA Corp.
New York, New York

49956
Raytheon Company
Lexington, Massachusetts

50088
Mostek Corp.
Carrollton, Texas

50579
Litronix Inc.
Cupertino, California

51605
Scientific Components Inc.
Linden, New Jersey

53021
Sangamo Electric Co.
Springfield, Illinois

54294
Cutler-Hammer Inc. formerly
Shallcross, A Cutter-Hammer Co.
Selma, North Carolina

55026
Simpson Electric Co.
Div. of Am. Gage and Mach. Co.
Elgin, Illinois

56289
Sprague Electric Co.
North Adams, Massachusetts

58474
Superior Electric Co.
Bristol, Connecticut

60399
Torin Corp, formerly
Torrington Mfg. Co.
Torrington, Connecticut

63743
Ward Leonard Electric Co., Inc.
Mount Vernon, New York

64834
West Mfg. Co.
San Francisco, Californai

65092
Weston Instruments Inc.
Newark, New Jersey

66150
Winslow Tele-Tronics Inc.
Eaton Town, New Jersey

70485
Atlantic India Rubber Works
Chicago, Illinois

70563
Amperite Company
Union City, New Jersey

70903
Belden Corp.
Geneva, Illinois

71002
Birnbach Radio Co., Inc.
Freeport, LI New York

71400
Bussmann Mfg.
Div. of McGraw-Edison Co.
Saint Louis, Missouri

71450
CTS Corp.
Elkhart, Indiana

71468
ITT Cannon Electric Inc.
Santa Ana, California

71482
Clare, C.P. & Co.
Chicago, Illinois

71590
Centrelab Electronics
Div. of Globe Union Inc.
Milwaukee, Wisconsin

71707
Coto Coil Co., Inc.
Providence, Rhode Island

71744
Chicago Miniature Lamp Works
Chicago, Illinois

71785
TRW Electronics Components
Cinch Connector Operations Div.
Elk Grove Village, Chicago, Illinois

72005
Driver, Wilber B., Co.
Newark, New Jersey

72092
Replaced by 06980

72136
Electro Motive Mfg. Co.
Williamantic, Connecticut

72259
Nytronics Inc.
Pelham Manor, New Jersey

72619
Dialight Div.
Amperex Electronic Corp.
Brooklyn, New York

72653
G.C. Electronics
Div. of Hydrometals, Inc.
Brooklyn, New York

72665
Replaced by 90303

72794
Dzus Fastener Co., Inc.
West Islip, New York

72928
Gulton Ind. Inc.
Gudeman Div.
Chicago, Illinois

72982
Erie Tech. Products Inc.
Erie, Pennsylvania

73138
Beckman Instruments Inc.
Helipot Division
Fullerton, California

73293
Hughes Aircraft Co.
Electron Dynamics Div.
Torrence, California

73445
Amperex Electronic Corp.
Hicksville, LI, New York

73559
Carling Electric Inc.
West Hartford, Connecticut

73586
Circle F Industries
Trenton, New Jersey

73734
Federal Screw Products, Inc.
Chicago, Illinois

73743
Fischer Special Mfg. Co.
Cincinnati, Ohio

73899
JFD Electronics Co.
Components Corp
Brooklyn, New York

73949
Guardian Electric Mfg. Co.
Chicago, Illinois

74199
Quan Nichols Co.
Chicago, Illinois

74217
Radio Switch Corp.
Marlboro, New Jersey

74276
Signalite Div.
General Instrument Corp.
Neptune, New Jersey

74306
Piezo Crystal Co.
Carlisle, Pennsylvania

74542
Hoyt Elect. Instr. Works
Penacook, New Hampshire

74970
Johnson E.F., Co.
Waseca, Minnesota

75042
TRW Electronics Components
IRC Fixed Resistors
Philadelphia, Pennsylvania

75376
Kurz-Kasch Inc.
Dayton, Ohio

75378
CTS Knights Inc.
Sandwich, Illinois

75382
Kulka Electric Corp.
Mount Vernon, New York

75915
Littlefuse Inc.
Des Plaines, Illinois

76854
Oak Industries Inc.
Switch Div.
Crystal Lake, Illinois

77342
AMF Inc.
Potter & Brumfield Div.
Princeton, Indiana

77638
General Instrument Corp.
Rectifier Division
Brooklyn, New York

77969
Rubbercraft Corp. of CA. LTD.
Torrance, California

78189
Shakeproof
Div. of Illinois Tool Works Inc.
Elgin, Illinois

78277
Sigma Instruments, Inc.
South Braintree, Massachusetts

78488
Stackpole Carbon Co.
Saint Marys, Pennsylvania

78553
Eaton Corp. Engineered
Fastener Div.
Tinnerman Plant
Cleveland, Ohio

79136
Waldes Kohinoor Inc.
Long Island City, New York

79497
Western Rubber Company
Goshen, Indiana

79963
Zierick Mfg. Corp.
Mt. Kisko, New York

80031
Electro-Midland Corp., Mepco Div.
A North American Phillips Co.
Morristown, New Jersey

80145
LFE Corp., Process Control Div.
formerly API Instrument Co.
Chesterland, Ohio

80183 - use 56289
Sprague Products
North Adams, Massachusetts

80294
Bourns Inc., Instrument Div.
Riverside, California

80583
Hammarlund Mfg. Co., Inc.
Red Bank, New Jersey

80640
Stevens, Arnold Inc.
South Boston, Massachusetts

81073
Grayhill, Inc.
La Grange, Illinois

81312
Winchester Electronics
Div. of Litton Industries Inc.
Oakville, Connecticut

81439
Therm-O-Disc Inc.
Mansfield, Ohio

81483
International Rectifier Corp.
Los Angeles, California

81590
Korry Mfg. Co.
Seattle, Washington

81741
Chicago Lock Co.
Chicago, Illinois

82305
Palmer Electronics Corp.
South Gate, California

82389
Switchcraft Inc.
Chicago, Illinois

82415
North American Phillips
Controls Corp.
Frederick, Maryland

82872
Roanwell Corp.
New York, New York

82877
Rotron Inc.
Woodstock, New York

82879
ITT Royal Electric Div.
Pawtucket, Rhode Island

83003
Varo Inc.
Garland, Texas

83058
Carr Co., The United Can Div.
of TRW
Cambridge, Massachusetts

83298
Bendix Corp.
Electric Power Division
Eatontown, New Jersey

83330
Smith, Herman H., Inc.
Brooklyn, New York

83478
Rubbercraft Corp. of America, Inc.
West Haven, Connecticut

83594
Burroughs Corp.
Electronic Components Div.
Plainfield, New Jersey

83740
Union Carbide Corp.
Battery Products Div.
formerly Consumer Products Div.
New York, New York

84171
Arco Electronics
Great Neck, New York

84411
TRW Electronic Components
TRW Capacitors
Ogallala, Nebraska

84613
Fuse Indicator Corp.
Rockville, Maryland

84682
Essex International Inc.
Industrial Wire Div.
Peabody, Massachusetts

86577
Precision Metal Products,
of Malden Inc.
Stoneham, Massachusetts

86684
Radio Corp. of America
Electronic Components Div.
Harrison, New Jersey

86928
Seastrom Mfg. Co., Inc.
Glendale, California

87034
Illuminated Products Inc.
Subsidiary of Oak Industries Inc.
Anahiem, California

88219
Gould Inc.
Industrial Div.
Trenton, New Jersey

88245
Litton Systems Inc.
Useco Div.
Van Nuys, California

88419
Cornell-Dubilier Electronic Div.
Federal Pacific Co.
Fuquay-Varian, North Carolina

88486
Plastic Wire & Cable
Jewitt City, Connecticut

88690
Replaced by 04217

89536
Fluke, John Mfg. Co., Inc.
Seattle, Washington

89730
G.E. Co., Newark Lamp Works
Newark, New Jersey

90201
Mallory Capacitor Co. Div of
P.R. Mallory Co., Inc.
Indianapolis, Indiana

90211 - use 56365
Square D Co.
Chicago, Illinois

90215
Best Stamp & Mfg. Co.
Kansas City, Missouri

90303
Mallory Battery Co.
Div. of Mallory Co., Inc.
Tarrytown, New York

91094
Essex International Inc.
Suglex/IWP Div.
Newmarket, New Hampshire

91293
Johanson Mfg. Co.
Boonton, New Jersey

91407
Replaced by 58474

91502
Associated Machine
Santa Clara, California

91506
Augat Inc.
Attleboro, Massachusetts

91637
Dale Electronics Inc.
Columbus, Nebraska

91662
Elco Corp.
Willow Grove, Pennsylvania

91737 - use 71468
Gremar Mfg. Co., Inc.
ITT Cannon/Gremar
Santa Ana, California

91802
Industrial Devices, Inc.
Edgewater, New Jersey

91833
Keystone Electronics Corp.
New York, New York

91836
King's Electronics Co., Inc.
Tuckahoe, New York

91929
Honeywell Inc.
Micro Switch Div.
Freeport, Illinois

91934
Miller Electric Co., Inc.
Div of Aunet
Woonsocket, Rhode Island

92194
Alpha Wire Corp.
Elizabeth, New Jersey

93332
Sylvania Electric Products
Semiconductor Products Div.
Woburn, Massachusetts

94145
Replaced by 49956

94154 - use 94988
Wagner Electric Corp.
Tung-Sol Div.
Newark, New Jersey

94222
Southco Inc. formerly
South Chester Corp.
Lester, Pennsylvania

95146
Alco Electronic Products Inc.
Lawrence, Massachusetts

95263
Leecraft Mfg. Co.
Long Island City, New York

95264
Replaced by 98278

95275
Vitramon Inc.
Bridgeport, Connecticut

95303
RCA Corp.
Receiving Tube Div.
Cincinnati, Ohio

95348
Gordo's Corp.
Bloomfield, New Jersey

95354
Methode Mfg. Corp.
Rolling Meadows, Illinois

95712
Bendix Corp.
Electrical Components Div.
Microwave Devices Plant
Franklin, Indiana

95987
Weckesser Co. Inc.
Chicago, Illinois

96733
San Fernando Electric Mfg. Co.
San Fernando, California

96853
Gulton Industries Inc.
Measurement and Controls Div.
formerly Rustrak Instruments Co.
Manchester, New Hampshire

96881
Thomson Industries, Inc.
Manhasset, New York

97540
Master Mobile Mounts
Div. of Whitehall Electronics Corp.
Ft. Meyers, Florida

97913
Industrial Electronic Hdware Corp.
New York, New York

97945
Penwalt Corp.
SS White Industrial Products Div.
Piscataway, New Jersey

97966
Replaced by 11358

98094
Replaced by 49956

98159
Rubber-Teck, Inc.
Gardena, California

98278
Malco A Microdot Co., Inc.
Connector & Cable Div.
Pasadena, California

98291
Sealectro Corp.
Mamaroneck, New York

98388
Royal Industries
Products Div.
San Diego, California

98743
Replaced by 12749

98925
Replaced by 14433

99120
Plastic Capacitors, Inc.
Chicago, Illinois

99217
Bell Industries Elect. Comp. Div.
formerly Southern Elect. Div.
Burbank, California

99392
STM
Oakland, California

99515
ITT Jennings Monrovia Plant
Div. of ITT Jennings formerly
Marshall Industries Capacitor Div.
Monrovia, California

99779 - use 29587
Bunker-Ramo Corp.
Barnes Div.
Landsdowne, Pennsylvania

99800
American Precision Industries Inc.
Delevan Division
East Aurora, New York

99942
Centrelab Semiconductor
Centrelab Electronics Div. of
Globe-Union Inc.
El Monte, California

Toyo Electronics
(R-Ohm Corp.)
Irvine, California

National Connector
Minneapolis, Minnesota

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Fluke Western Technical Center
Tom Marshall, Service Manager
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Fluke Mideastern Tech. Ctr.
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Clifton
Fluke Eastern Technical Center
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Mountlake Terrace
John Fluke Mfg. Co., Inc.
Bill Fetrow, Tech. Service Spvr.
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Tel. (206) 774-2206

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Fluke Canadian Technical Center
Ed Zahodnik, Service Manager
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Tel. (403) 276-9658

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Mississauga
Fluke Canadian Technical Center
Herb Duval, Service Manager
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Zip: L4V 1J5
Tel. (416) 678-1500

QUEBEC
Longueuil
Fluke Canadian Technical Center
Mel Richard, Service Manager
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Appendix 7A
Manual Change Information

INTRODUCTION

This manual documents the model 1912A Multi–Counter and its assemblies at the revision letter shown in table 7a–1. If your instrument contains assemblies with earlier or later rev letters as those listed in table 7a–1 see paragraphs "Older Instruments", "Newer Instruments" respectively.

Table 7a–1 Current Assembly Revision Levels

Reference/ Option No.	Assembly	Part No.	Rev. Letter
A1	Main PCB	Select Required Version	
A1	Main PCB (115/230V)	462143 [1]	E
A1	Main PCB (100V)	462150 [1]	E
A1	Main PCB –01	463257 [1]	E
A1A1	Display PCB	462648 [1]	B
A1A2	Prescaler PCB	458877	C
A2	Inverter PCB	443390	B
A3	AC PCB	Select Required Version	
A3	AC PCB (115V/58–62Hz)	456244	B
A3	AC PCB (230V/48–52Hz)	459354	B
A3	AC PCB (100V/48–52Hz)	459388	A
A3	AC PCB (110V/58–62Hz)	463299	
	[1] It is not possible to order the assembly by using this part number, please see next higher assembly.		

NEWER INSTRUMENTS

As changes and improvements are made to the instrument, they are identified by incrementing revision letter on the pcb assembly. These changes are documented on a supplemental change/errata sheet which, when applicable, appears at the front of the manual. If your manual requires a change/errata but does not contain one contact your nearest sales representative. Be prepared to provide him with the revision letter (and six digit part no. if applicable) of the pcb assembly in question.

OLDER INSTRUMENTS

The following information will backdate the 1912A manual such that it will apply the older instruments. To use this information check the Rev. letters of your instruments assemblies against those listed in the front of this manual. If the Rev letters match, no backdating changes need be made. If the Rev letters do not match, go to Table 1 to determine what changes you must make to the manual so that it will accurately reflect the instrument you have.

Table 1 Backdating Requirements (to be made to manual)

REF OR OPTION NO.	ASSEMBLY NAME	FLUKE PART NO.	TO ADAPT MANUAL TO EARLIER REV CONFIGURATIONS PERFORM CHANGE NO. GIVEN UNDER DESIRED REV LETTER.																						
			A	B	C	D	E	F	G	H	J	K	L	M	N	P	D-1								
A1	Main PCB (115/230V)	462143				1											2								
A1	Main PCB (100V)	462150				1											2								
A1	Main PCB –01	463257				1											2								

CHANGE #1

Make indicated changes to Main PCB parts list.

Delete following items:

U15 P/N 402610, R51 P/N 348920, R52 P/N 348839

Add following items:

R18 P/N 348821

Modify following items:

R20 10k pot P/N 309674, to R20 1.8k P/N 441444.
R39 10k P/N 348839, to R39 100k P/N 348920.
R38 1k P/N 343426, to R38 10k P/N 348839.
R17 22k P/N 348870, to R17 4.7k P/N 348821.
C32 0.01 uF P/N 149153 to C32 10 uF P/N 193623.

MAKE INDICATED CHANGES TO TEXT, WHERE SPECIFIED.

Delete following items:

Paragraph 4-24.

Add following items:

Paragraph 4-24, below.

23. Trigger Level Adjustment (Channel A)

24. The trigger level adjustments should be performed whenever repairs have been made to the input section the counter. Perform the trigger level adjustment as follows:

1. Remove the instrument from it's case.

2. Energize the counter (refer to #1 warning under general maintenance of Section 4) connect the high frequency generator and an RF millivoltmeter via a T-connector terminated into 50Ω to the channel A input.

3. Set the front panel trigger level control to the preset position.

4. Set the generator to 75 mV output level at about 100 MHz. Note the display reading as a reference.

5. Reduce the input level until the display becomes unstable and then try to adjust R11 (internal trigger level, see Figure 4-1) for the reference reading as noted in step 4.

6. Repeat step 4 and 5 until no additional sensitivity is possible. The display must remain as noted in step 4, with an input level below 75 mV.

Modify following items:

Make indicated changes to all schematics, diagrams and figures as follows:

Delete following items from Figures: 5-2, 601-2, 8-1 and 8-2 (sheet 2 & 3)

U15, R51, R20 and its ground, R52, ground from C28 and +5V from R38.

Add following items to Figures: 5-2, 601-2, 8-1 and if applicable 8-2 (sheet 2 & 3).

HYST line, see Figure 1
R20 1.2k, see Figure 2
R18 4.7k, see Figure 2
+5V to C28, see Figure 3
Ground to R38 10k, see Figure 3

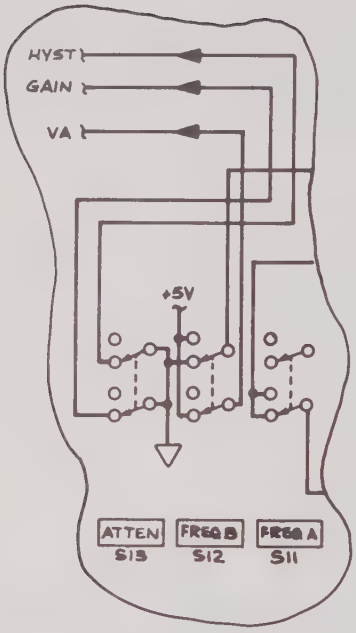

FIGURE –1

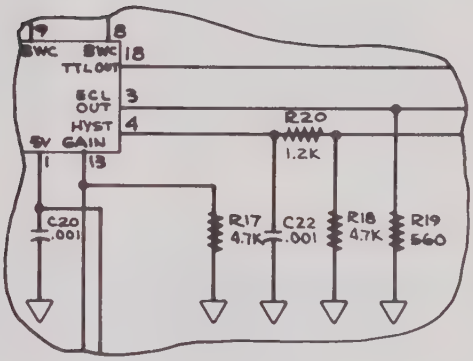

FIGURE –2

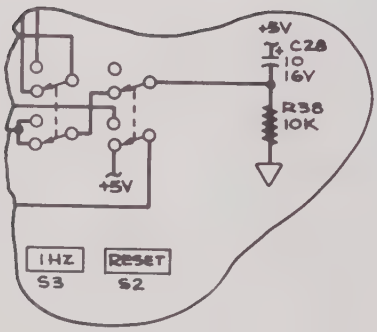

FIGURE –3

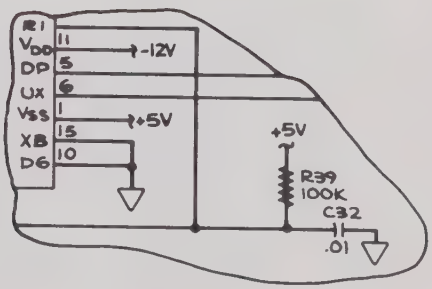

FIGURE –4

Modify following items to Figures: 8-2 (sheet 2 & 3)

R39 10k to R39 100k, see Figure 4
R38 1k to R38 10k, see Figure 3
R17 22k to R17 4.7k, see Figure 2
C32 10 uF to C32 .01 uF, see Figure 4

CHANGE #2

MAKE THE FOLLOWING CHANGES TO PARTS LIST

Delete Following Items:

U15 P/N 402610, R51 & R39 P/N 348920, R52 & R38 P/N 348839, C32 P/N 149153, C28 P/N 193623.

ADD FOLLOWING ITEMS:

R18 P/N 193623,
In Section 5, page 5-3, add the following to the final
Assembly: A4 Reset PCB Assembly [1]
In Section 6, page 601-2, Table 601-1, Final Assembly,
Add: A4 Reset PCB Assembly (see section 5 Final Assembly) [1]
In Section 5, page 5-18, add the following table and figure:

1910A/1911A Reset PCB Assembly

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART. NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A4	RESET PCB ASSEMBLY Figure 5-5	[1]					
C28, C32	Cap, Ta, 10 μF ±20%, 15V	193623	56289	196D106X 0015KA1	2		
R52, R39	Res, dep car, 10k ±5%, 1/4W	348839	80031	CR251-4-5P10KT	2		
R38	Res, dep car, 1k ±5%, 1/4W	343426	80031	CR251-4-5P1KT	1		
U15	IC, linear timer	402610	12040	LM555CN	1		
1 thru 5	Amp pins	376574	00779	3-87022-1	5		

[1] Not procurable at this level

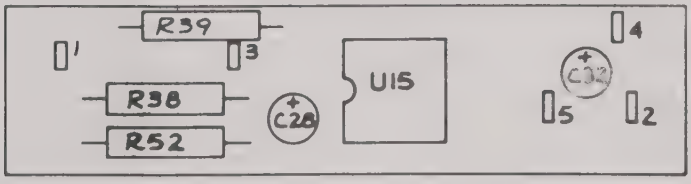

Figure 5-5. Reset PCB Assembly

MODIFY FOLLOWING ITEMS:

From R20 10k pot P/N 309764 to R20 1.8k P/N 441444.
From R17 22k P/N 348870 to R17 4.7k P/N 348821.

MAKE INDICATED CHANGES TO TEXT AS FOLLOWS:

Delete following items:

Paragraph 4-24.

Add following items: to Section 3, page 3-7:

3-50. Reset

3-51. The model 1912A ensures that its display resets to zero after any resolution switch has been actuated by means of a Reset PCB (assembly - A4) shown in Section 5. The Reset PCB uses an IC timer (and associated circuitry) in series with S11 and U6-7 (see schematic diagram Figure 8-11) to lengthen the reset pulse generated by the resolution switches such that the counce caused by the closing of the resolution switches will not affect the operation of the controller U6.

Add the following paragraph:

4-24. The trigger level adjustment should be performed whenever repairs have been made to the input section of the counter. Perform the trigger level adjustment as follows:

1. Remove the instrument from it's case.

2. Energize the counter (refer to #1 warning under general maintenance of Section 4) connect the high frequency generator and an RF millivoltmeter via a T-connector terminated into 50Ω to the channgel A input.

3. Set the front panel trigger level control to the preset position.

4. Set the generator to 75 mV output level at about 100 MHz. Note the display reading as a reference.

5. Reduce the input level until the display becomes unstable and then try to adjust R11 (internal trigger level, see Figure 4-11 for the reference reading as noted in step 4.

6. Repeat step 4 and 5 until no additional sensitivity is possible. The display must remain as noted in step 4. With an input level below 15 mV.

MAKE INDICATED CHANGES TO ALL SCHEMATICS, DIAGRAMS AND FIGURES AS FOLLOWS:

Delete From Figures 5-2, 601-2, 8-1 and 8-2 (sheet 2 & 3)

U15, R51, R20 and its ground, R52, C28 and its ground, R38 and its +5V, R39 and C32.

Add to Figures 5-2, 601-2, 8-1 and 8-2 (sheet 2)

HYST line, see Figure 1
R20 1.8k, see Figure 2
R18 4.7k, see Figure 2

Add to Figure 8-2 (sheet 3)

(R52, R39, C28, C32, R38 and U15) see Figure 3

Modify to Figure 8-2 (sheet 3)

From R17 22k to R17 4.7k, see Figure 2

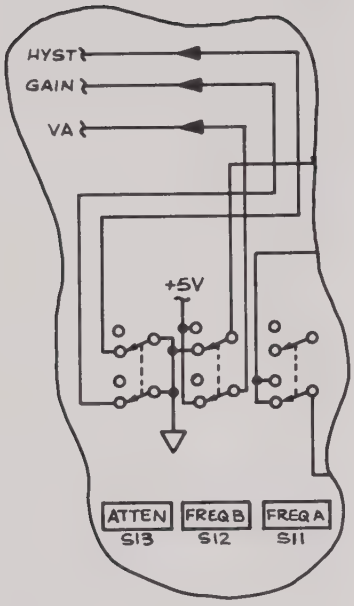

FIGURE –1

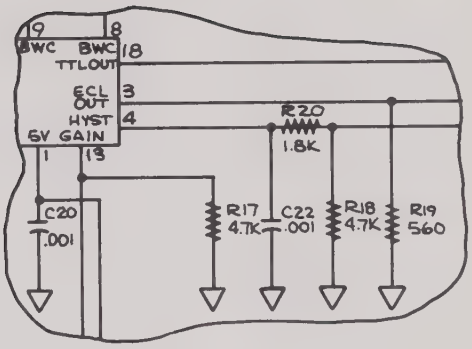

FIGURE –2

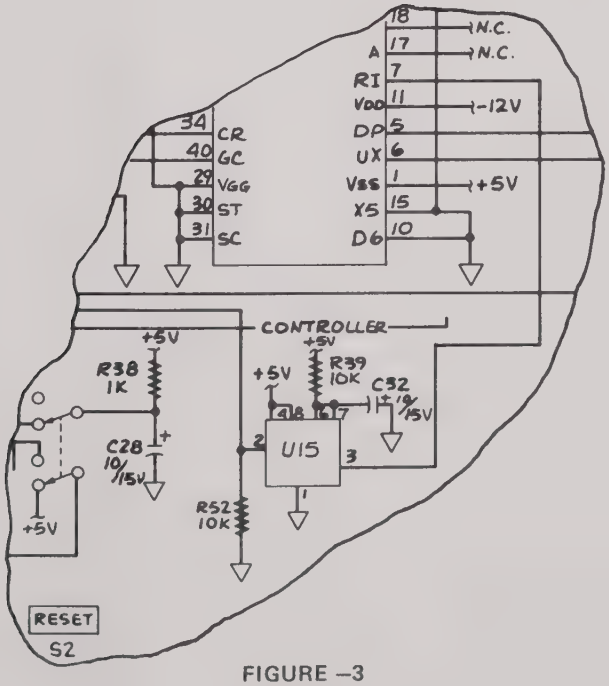

FIGURE –3

Section 8
Schematic Diagrams

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8-3	Display PCB Component Location	1910A-1602	8-6
8-4	Display Schematic	1910A-1020	8-7
8-5	520 MHz Prescaler Component Location	1910A-1607	8-8
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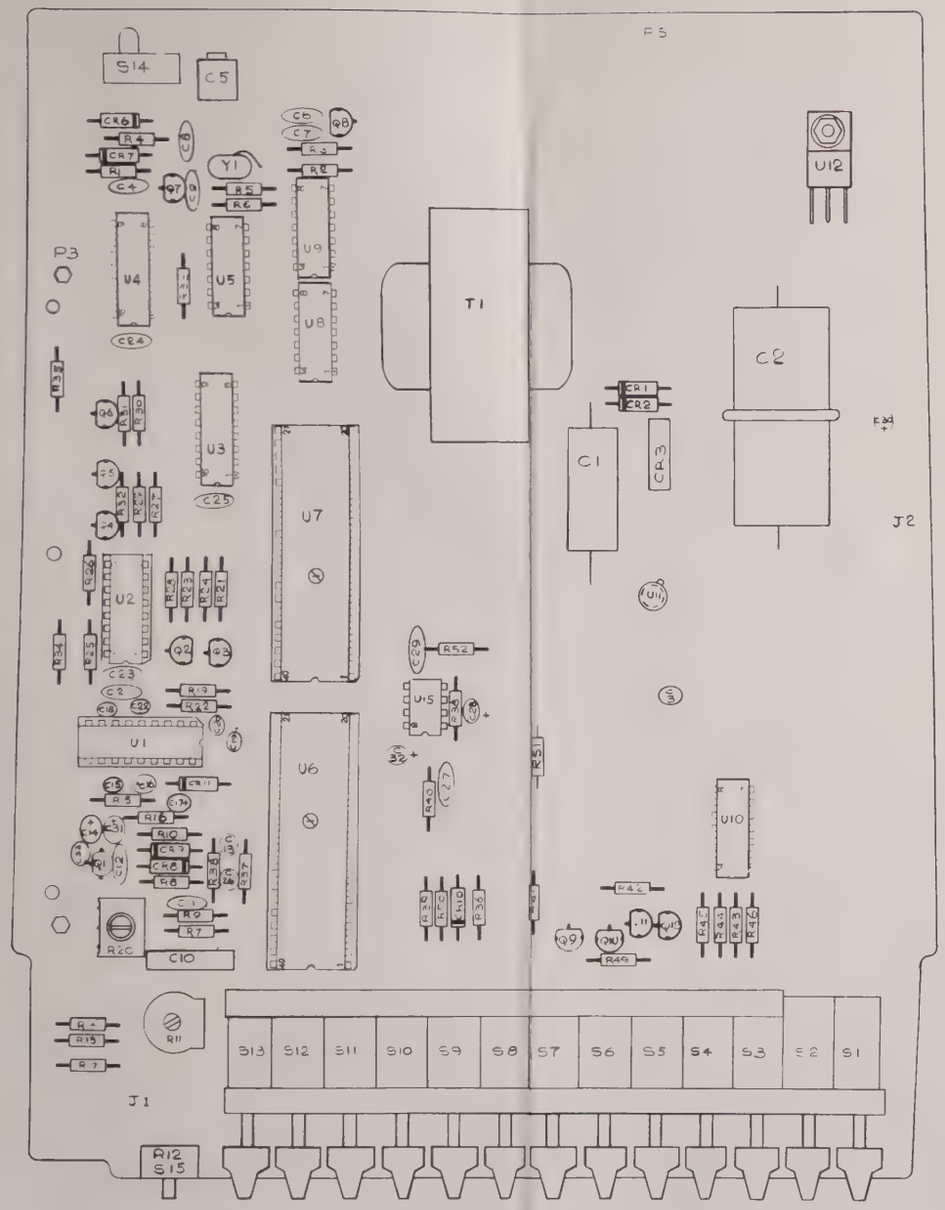
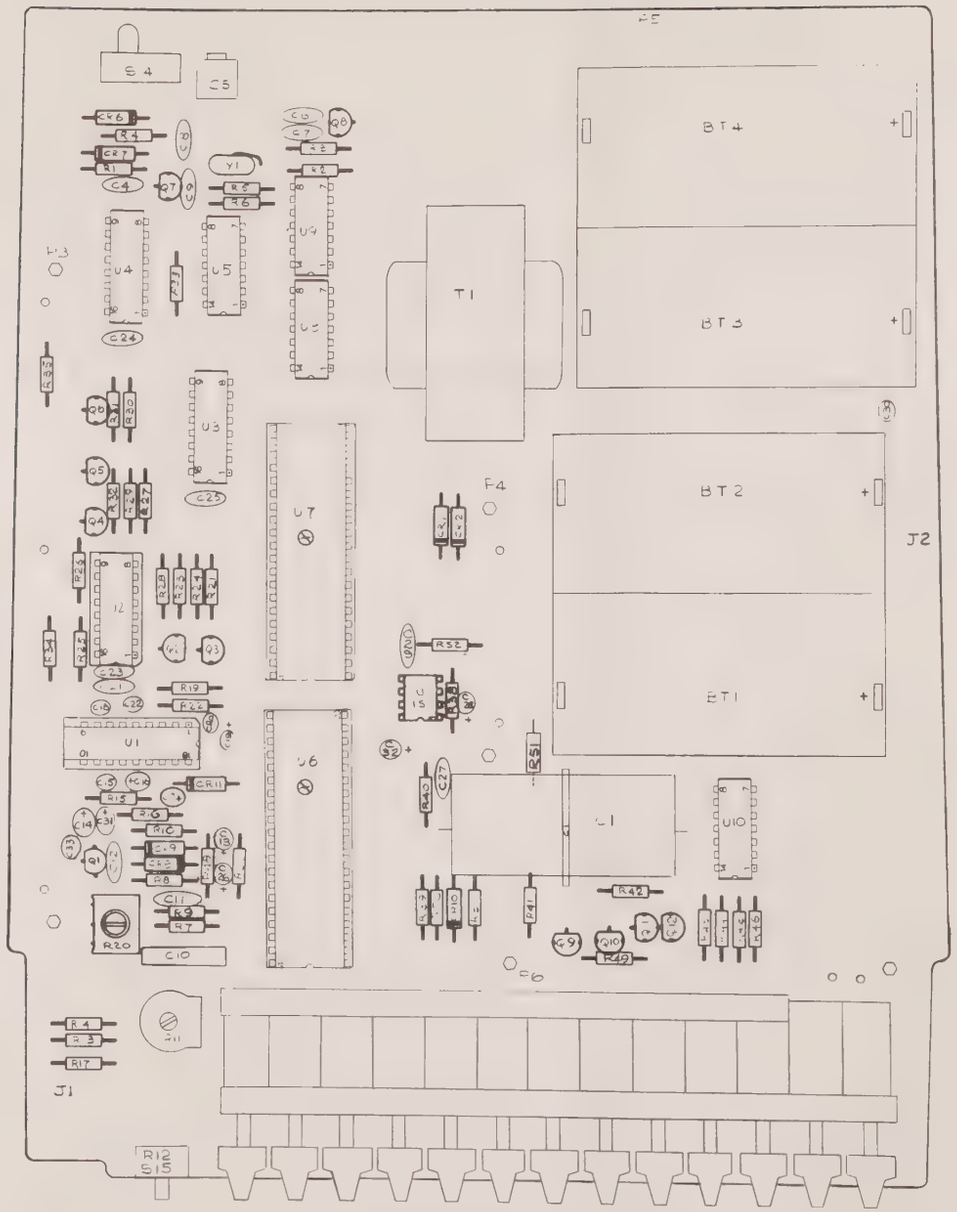
8-7	Inverter PCB Component Location, (Option —01 Only)	1910A-1604	8-10
8-8	Inverter PCB Schematic, (Option —01 Only)	1910A-1004	8-11
8-9	AC PCB Component Location, (Option —01 Only)	1910A-1606	8-12
8-10	AC PCB Schematic, (Option —01 Only)	1910A-1006	8-12



(LINE POWER)



(BATTERY POWER)

Figure 8-1. Main PCB Component Location (1910A-1601)

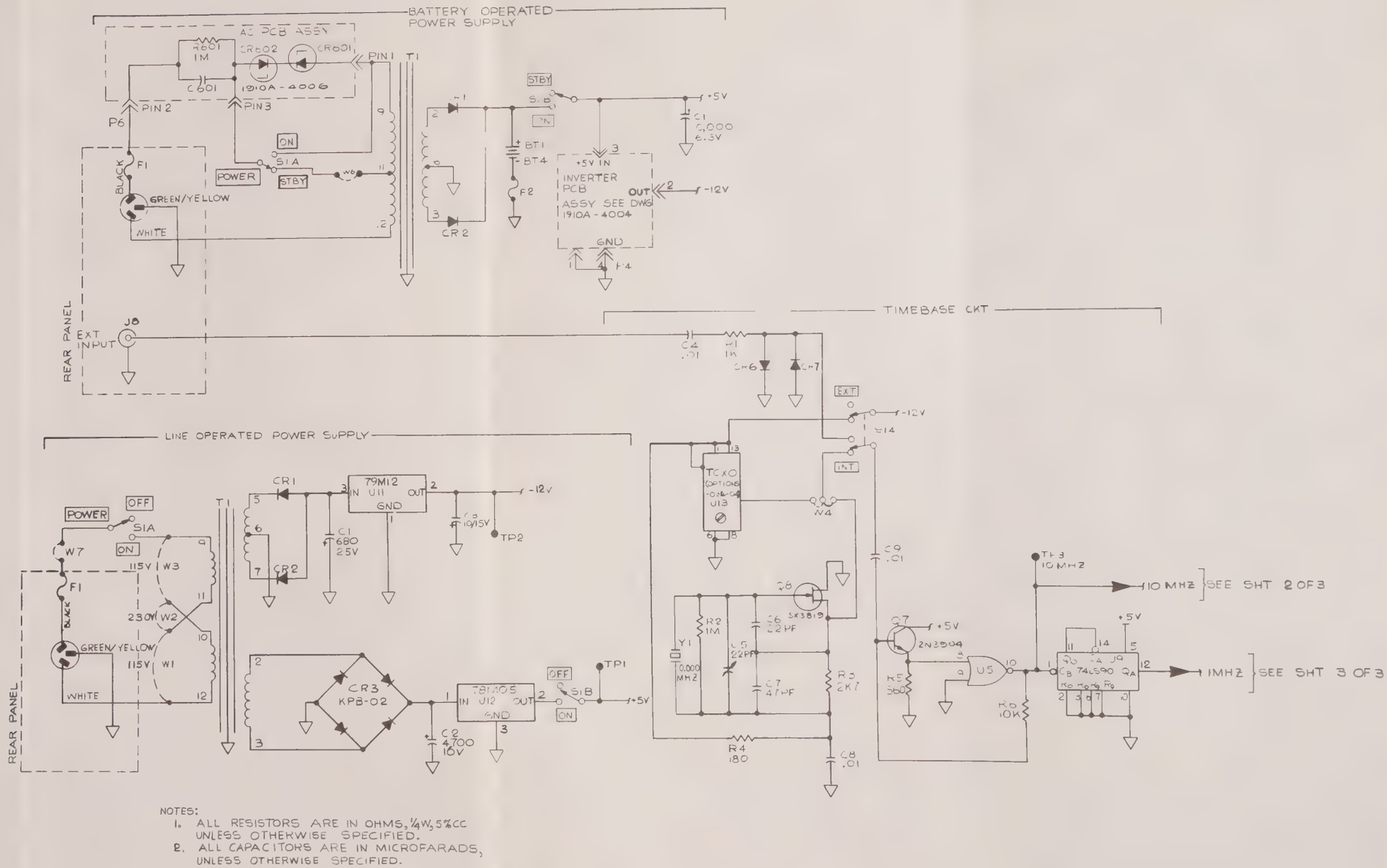
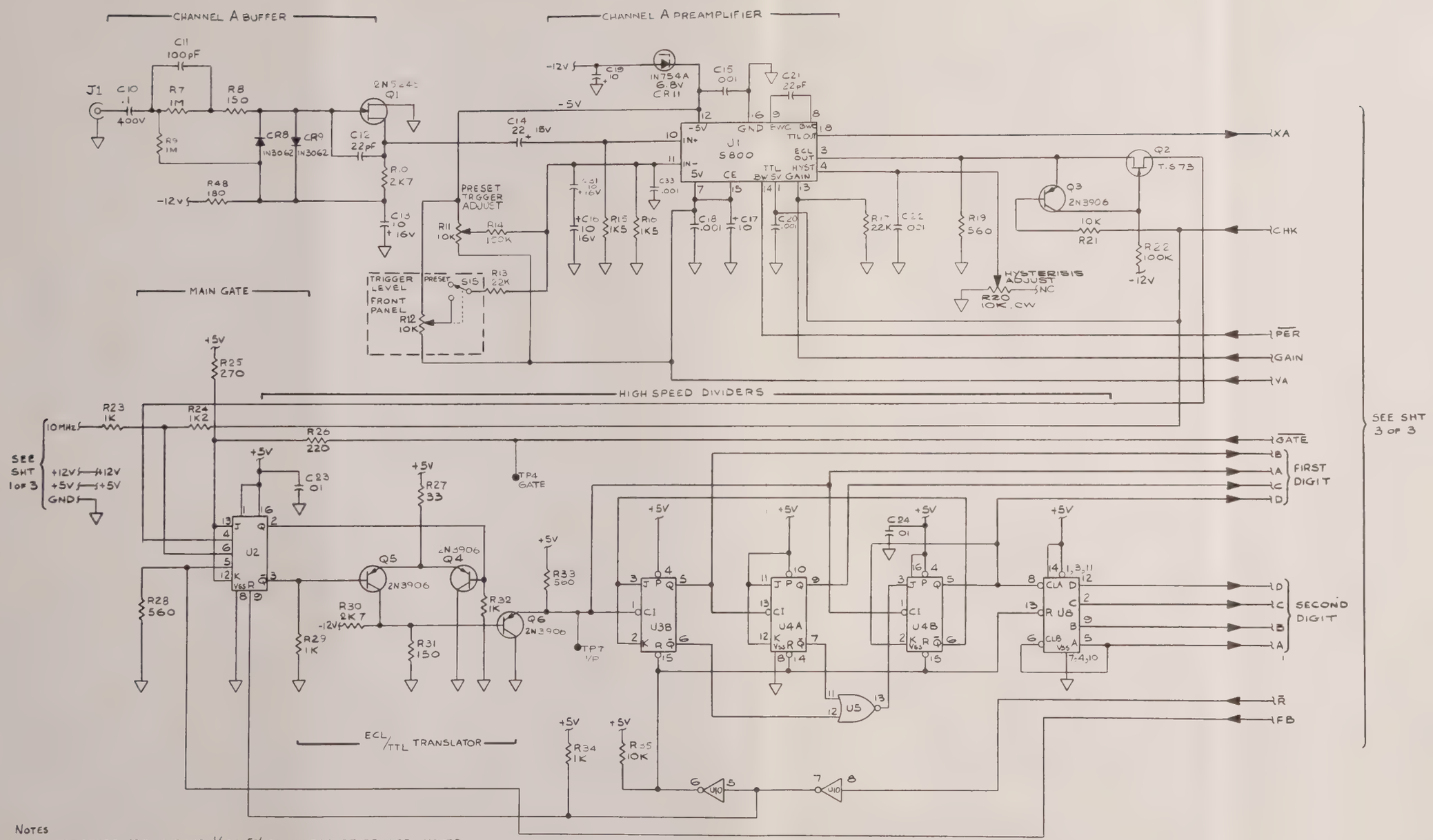


Figure 8-2. Main PCB Schematic (Sheet 1 of 3)
(1910A-1001)

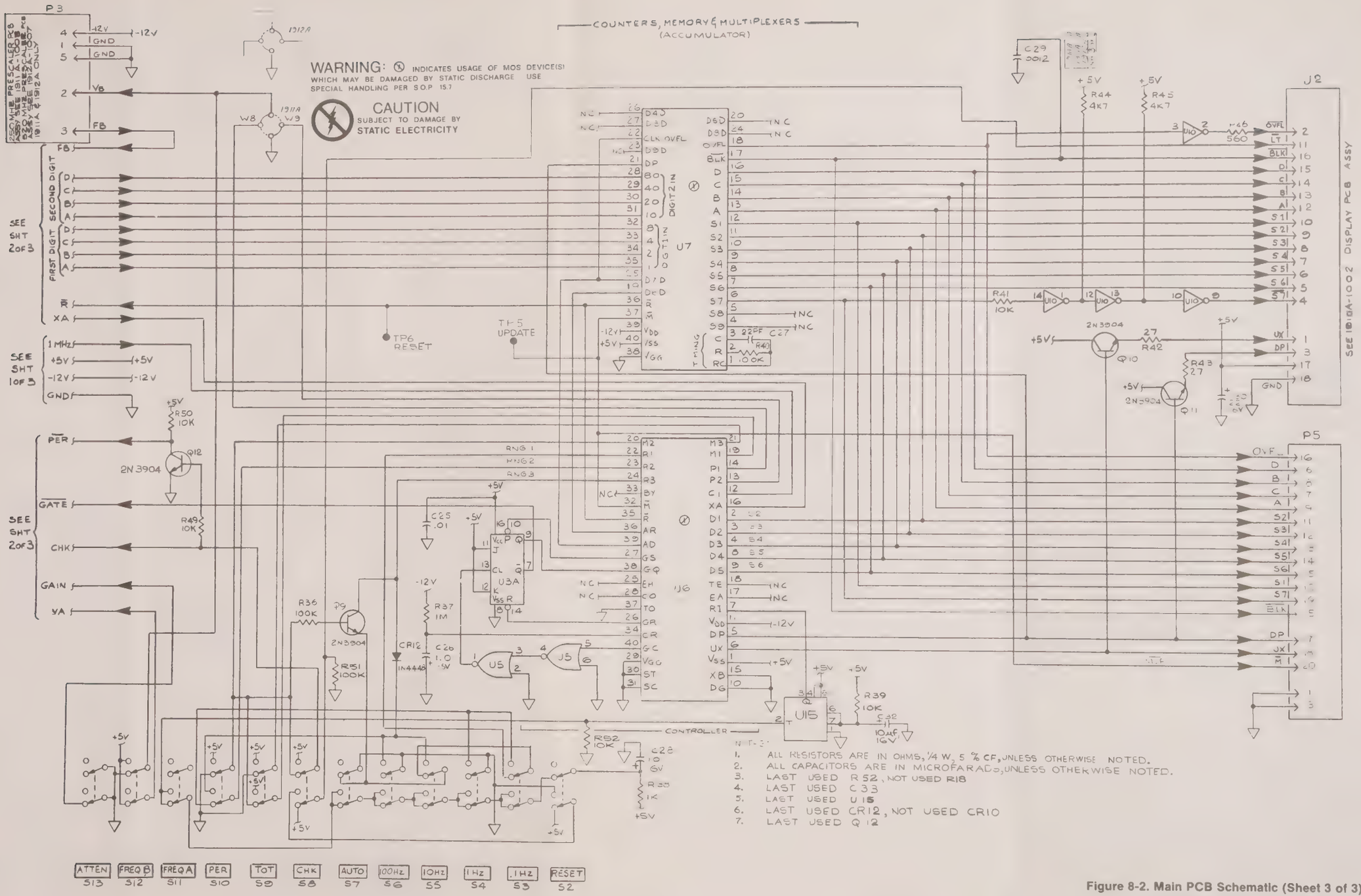


NOTES

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% CF, UNLESS OTHERWISE NOTED
2. ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE NOTED.

Figure 8-2. Main PCB Schematic (Sheet 2 of 3)

(1910A-1001)



NOTES:
1. ALL RESISTORS ARE IN OHMS, 1/4 W, 5 % CF, UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE NOTED.
3. LAST USED R52, NOT USED R18
4. LAST USED C33
5. LAST USED U15
6. LAST USED CR12, NOT USED CR10
7. LAST USED Q12

Figure 8-2. Main PCB Schematic (Sheet 3 of 3)
(1910A-1001)

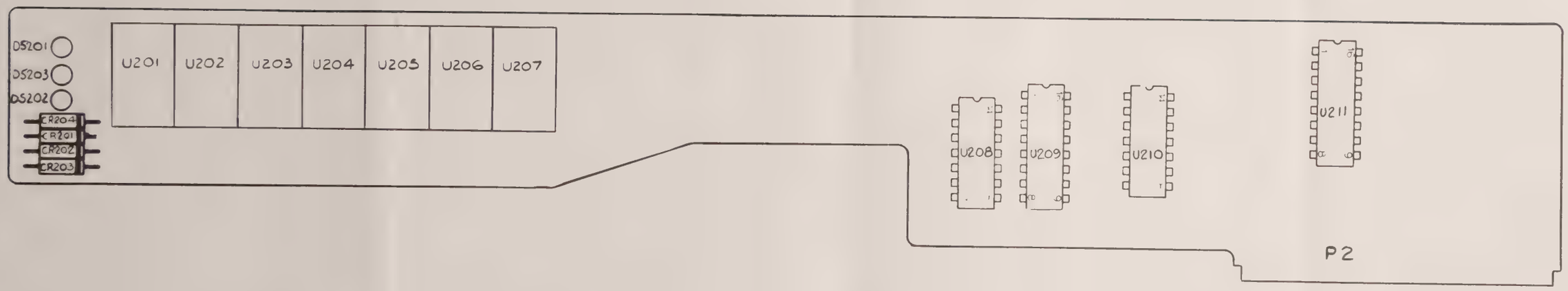


Figure 8-3. Display PCB Component Location
(1910A-1602)

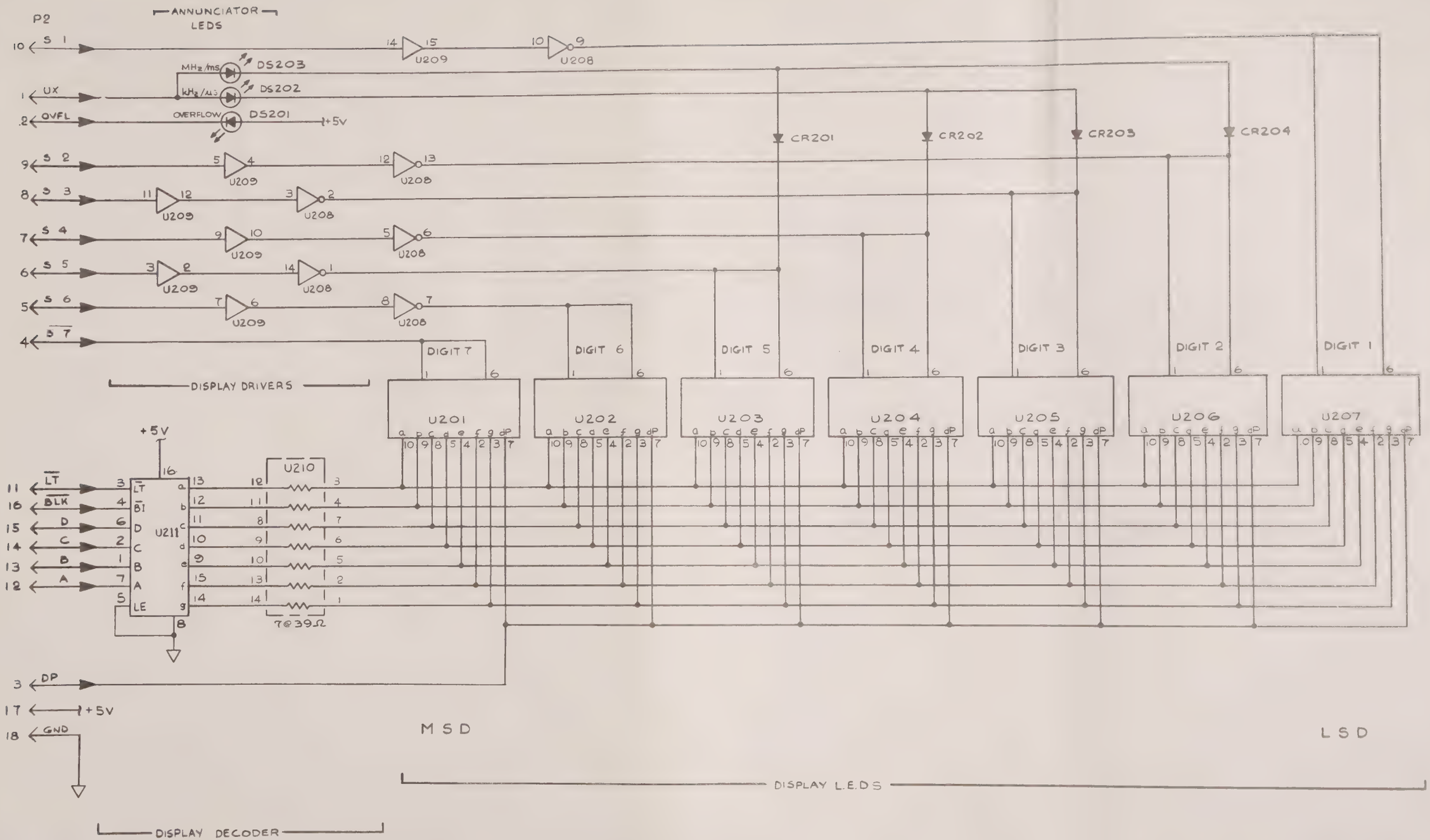


Figure 8-4. Display PCB Schematic (1910A-1020)

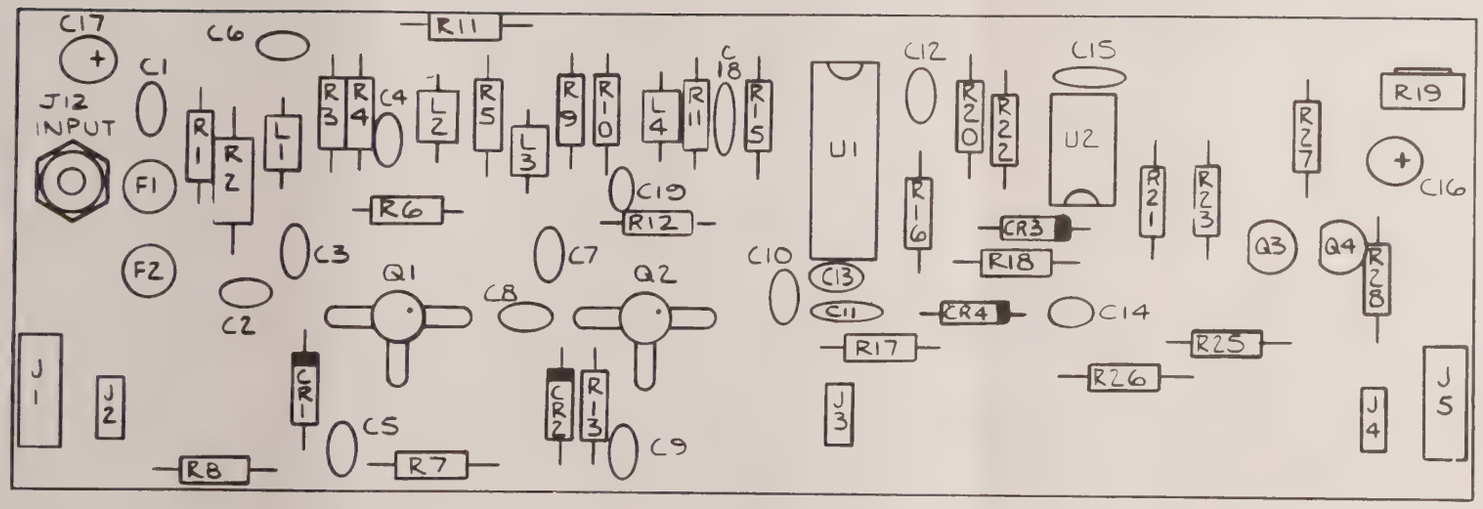


Figure 8-5. 520 MHz Prescaler Component Location (1910A-1607)

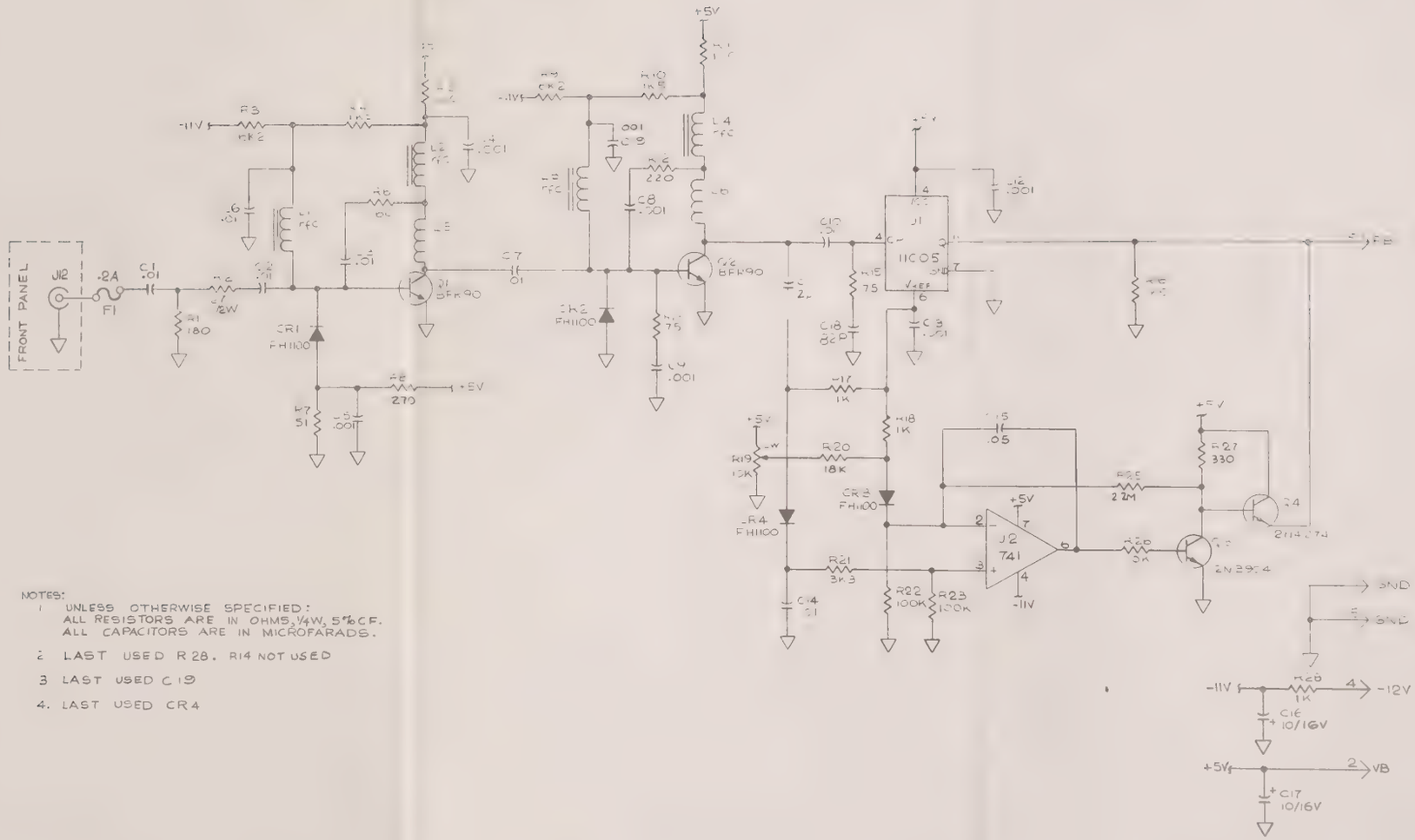


Figure 8-6. 520 MHz Prescaler Schematic (1910A-1007)

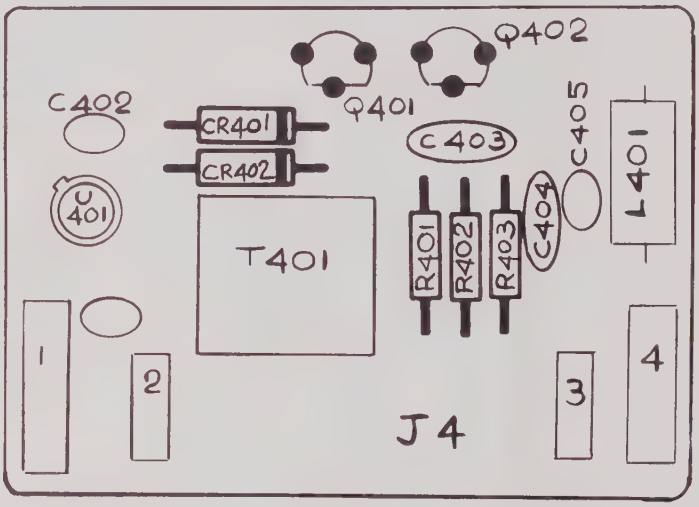
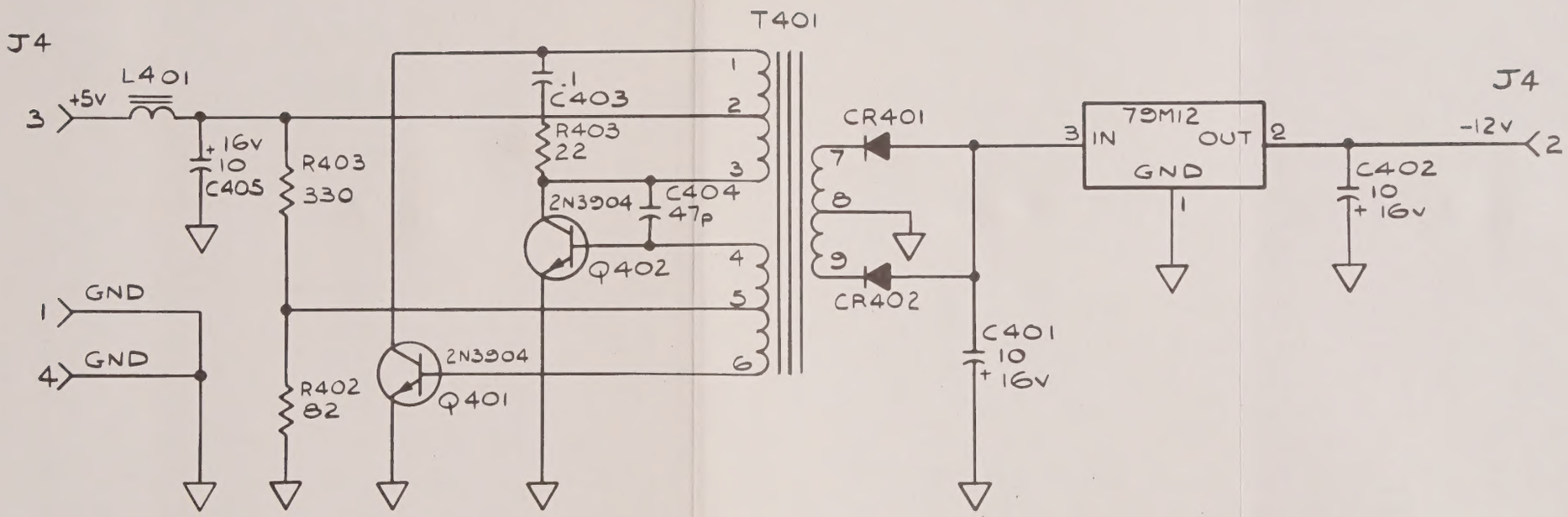


Figure 8-7. Inverter PCB Component Location (Option —01 Only)



1. ALL RESISTORS ARE IN OHMS 1/4 W., 5% CC., UNLESS OTHERWISE STATED.
2. ALL CAPACITORS ARE IN MICROFARADS; UNLESS OTHERWISE NOTED.

Figure 8-8. Inverter PCB Schematic (Option —01 Only)

Table 8-1. Mnemonics

A = BCD (1)
B = BCD (2)
C = BCD (4)
D = BCD (8)
a =
b =
c =
d = Seven-/-Segment
e = decoded BCD.
f =
g =
ATTEN = Attenuator
AUTO = Autoresolution
BLK = Blanking Rulse to Display, low = time
CHK = Check
DP = Decimal Positioning Pulse
FB = Conditioned Frequency B Signal
GAIN = Gain to U6
$\overline{GATE}$ = Inverted Gate Pulse
HYST = Hysteresis to U6
$\overline{M}$ = CMOS Pulse to update memories in Display Section, low = true
M2 = Transition pulse for period mode, blocks ECL level, high = true
$\overline{MUP}$ = M
OVL = Overflow
PER = Period
$\overline{R}$ = TTL Pulse to Reset display decode counters low = true
STBY = Standby
$\overline{S1}$; $\overline{S7}$ = Negative switch pulse
S8, S9 = Switch pulse
TOT = Totalize
UX = Units annuciation, multiplexed high = true
VA = Chan A, 5V supply
VB = Chan B, 5V supply, high = true
XA = Conditioned Frequency A Signal, from Preamp (used in period)

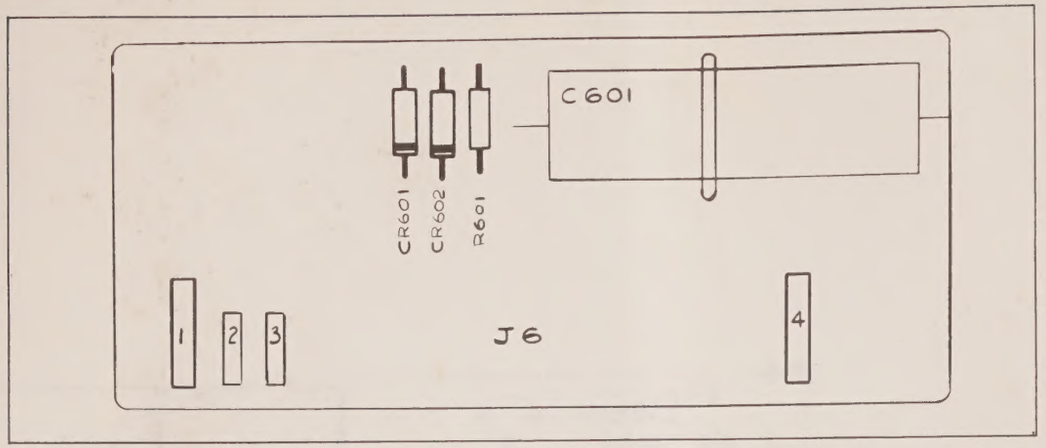
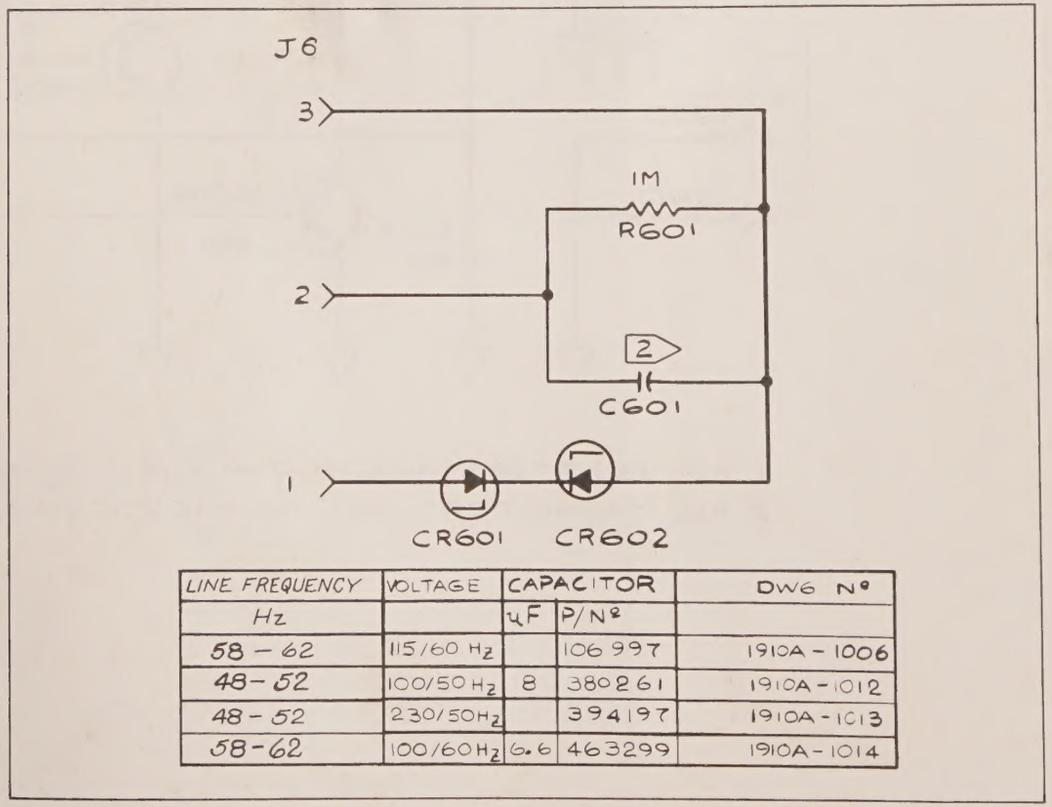


Figure 8-9. AC PCB Component Location (Option —01 Only)



LINE FREQUENCY Hz	VOLTAGE	CAPACITOR µF	CAPACITOR P/N#	DWG N°
58 – 62	115/60 Hz		106997	1910A-1006
48–52	100/50 Hz	8	380261	1910A-1012
48 – 52	230/50Hz		394197	1910A-1013
58-62	100/60Hz	6.6	463299	1910A-1014

Figure 8-10. AC PCB Schematic (Option —01 Only)

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